COAL AGE

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The Colorado Strike and the Press

The venality of the public press has rarely been more clearly exhibited than in its treatment of the Colorado strike. We do not refer to its editorial utterances because it is hard for a paper which is not published for the capitalist to side openly with him, for while he and his sympathizers purchase single copies of the newspapers, his enemies and contemners, being many, purchase perhaps twenty. The press is content to follow its readers and refuses to lead.

But surely while hiding its personal feelings in the editorial columns in the hope of extending circulation, the press should have been willing to enter on the less dangerous policy of publishing the report of the military committee. Had it been a contemptible, driveling defense of the militia, it might have been condemned for partisanship; had it been a dry, uninteresting report, it might have been passed over as of no moment, but its fairness stamps it as a document not to be disputed, and its treatment and subject mark it as a news item not to be despised.

We shall however speak solely of its fairness and not of its dramatic interest. It declares that the militiamen should be court-martialed, that Lieutenant Linderfelt, while an experienced soldier, was an inexperienced sociologist, wholly tactless in his treatment of both mine guards and strikers, that he struck Tikas over the head with the stock of his gun so severely as to break that weapon, that the same man Tikas and two others while attempting escape were shot down most probably by the militia.

The commission also declares that the militia fired on some of the foremost tents in the colony, and that the Ludlow camp was burned and looted by the parties which invaded it. It condemns the operators for introducing "ignorant, lawless and savage South European peasants," though how it can be a crime to hire men which the nation permits to enter at its ports we cannot see. The report also refuses to enter into the relative merits of the controversy between operators and miners.

In fact if the report is in any way *ex parte*, its authors may be credited as having been so upright that they leaned backward in their desire to avoid even the slightest suggestion that their report was dictated by either the militia or the operators. Major Edward J. Boughton, the head of the commission, is a lawyer of high standing, and his findings stamp him as just and impartial.

However, out of all the findings of his committee, only the most unfavorable of the statements we have mentioned have been published by the Eastern press. Others which we quoted last week have been entirely ignored. Had they been printed they would have created an entirely different view from that now current.

The attack on the militia did not start till the soldiers had impatiently watched the riflemen of the colony take up a position of advantage in a railroad cut. The enlisted men bitterly resented the forbearance of their leaders which permitted the gunmen of the camp to pass unmolested across an unprotected area to a position of such strength, and to open battle at their convenience. But those leaders had determined to wait till the strikers attacked and it was only when these men driven from the cut returned to the colony that the fire was directed toward it and then only at the first line of tents.

The burning of the colony, the clubbing of Tikas, the firing on the escaping men followed

only after Martin, one of the militiamen, had been found brutally mutilated and the fight had been waged for many hours. The single non-combatant killed by a bullet was the boy Snyder, and his own father is said to have declared that the child met his death at the hands of strikers and not of the militia.

Tikas was struck by Linderfelt in an altercation and shot at a distance as he was escaping to the colony. Yet his death and that of the other prisoners should certainly be investigated, and it appears unlikely that Linderfelt's violence to Tikas can be completely exonerated.

The military commission declares that many of the bullets of the strikers were made poisonous by the insertion of verdigris. Blood poisoning invariably follows wounds made with such projectiles. The report denies that any of the persons attacking the colony used explosive bullets. It states that the cupronickle jacketed bullets used in the present Springfield rifle make a noise in passing through the air resembling that of an explosion and can easily lead inexperienced spectators to think that the bullets are of the explosive type.

Are we not justified in regarding the bloodshed in Colorado as an aftermath of the Balkan and Italo-Turkish wars? Disbanded soldiers are always dangerous and the Ludlow camp was largely populated with such men. The report says:

> The colony numbered hundreds of people of whom only a few families were American. The rest consisted for the most part of Greeks, Montenegrins, Bulgars, Servians, Italians, Mexicans, Tyrolese, Croatians, Austrians, Savoyards and other aliens from the southern countries of Europe. We are credibly informed that within the colony 22 different tongues were spoken.

There are natives of all countries and races on whom every reliance can be placed, but in view of the stories of the murders, maimings and outrages, almost beyond belief, which followed the Balkan war and caused the appointment of an international board of inquiry, we feel it is but just to give the defenders of American people and American property a fair and unbiased hearing when warring with such races, to suppress nothing which is in their favor and to extenuate nothing which their enemies have done.

If the press on all occasions takes the view that our native-born are always and unalterably wrong, we make our history a lie and our future a misgiving. True; there has been some misdoing on the part of the mine guards and militia; fire has been met in part by fire, such men as were available for defense were hired and some have not always been as well disciplined as the best of regulars. But on the whole we cannot find reason for any general censure of the organization faced as they were by such conscienceless foes.

Sometimes they thought when men came from a camp with arms in their hands and began to fire on them from trenches that they were really in the presence of war and fully justified in using their weapons in actual defense and attack as well as in drill and target practice.

It is not those men who should bear the main brunt of our condemnation, but these aliens who have brought us a new glimpse of the Middle Ages and have disgraced our orderly civilization by their unwonted crimes.

So prone are we today to expect of soldiers a high standard of humanity, whereas we demand little or nothing from the immigrants who come to us from southern Europe, that even we, in preparing this editorial, have given undue prominence to the weaknesses of the former parties and passed over, as to be anticipated, the violence and savagery of the latter.

Who were armed without justification? Who delivered the attack? Who fired the first shot? Who drew the fire toward the shelter pits in which other men in the camp had concealed their women and children? Who refused to rescue these victims? Who mutilated Martin, Hockensmith and Chavez? Who used poisoned bullets, tied Heno to the floor and set the house afire? Who avenged themselves on the helpless mules of the operators? Who stretched wires to trip the horses of the militia when there was no fighting in progress? Who destroyed nine mine plants? Those whose violence has caused the United States army to enter the field.

And now lest these aliens with dripping fingers resent our action, we disarm the coal company guards before compelling the foreigners to surrender their weapons. And we deny to the operators the right to hire men and heap upon them every possible obloquy.

This is the land of the immigrant; truly our neuroticism gives him preference over the native born.

Electricity in Coal Mining

By David R. Shearer*

SYNOPSIS—This is the second article of the series on this subject. The distinction between alternating and direct current is here made and the explanation given of how Ohm's law must be varied to meet the condition of impedance.

An alternating differs from a direct or continuous current in that the voltage and current periodically rise to a maximum value then fall back through zero to a maximum negative value then rise again back to zero, thus repeating indefinitely. The entire period from zero through a positive value, back through zero to a negative value and then to zero again represents what is known as a cycle. The number of cycles occurring during one second is technically spoken of as the frequency of the system. The most usual frequency is 60 cycles per second or as a cycle is two alternations, 7200 alternations per minute, although for power purposes frequencies are in use as low as 15 cycles and some years ago a lighting frequency as high as 133 was not uncommon.

Represented graphically, a direct current would appear as in Fig. 1 when delivering power to a constant load. Alternating current would appear as in Fig. 2 under the same conditions and when the voltage and current are in phase or reach maximum values at the same instant. A curve, such as is shown in this figure, is known as a sinusoid or sine curve.

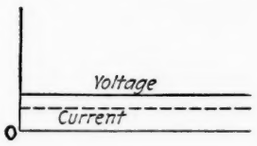

Fig. 1. Direct Current at Constant Load

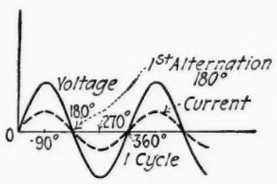

Fig. 2. Single-Phase Alternating Current

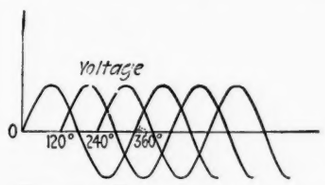

Fig. 3. Three-Phase Alternating Current

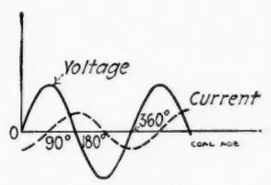

Fig. 4. Current Lagging behind Voltage

For more complete understanding of the fundamentals of alternating current, the reader is advised to consult some theoretical work on this subject.

The alternating current represented in Fig. 2 is known as a single phase but if two or more sets of waves are superimposed as in Fig. 3 the current becomes polyphase. The most usual of the polyphase currents is three phase, a voltage wave of which is represented in Fig. 3.

In referring to the voltage and current of an alternating circuit, we do not mean the maximum or peak value of either but the effective or virtual values; that is, a voltage or current equivalent to a direct voltage or current of the same effective values or as an example, if a certain voltage is required to burn a given lamp to a certain value and intensity, we speak of an alternating-current voltage of the same value when it burns the same lamp with the same degree of brilliancy. These values are really the square roots of the mean squares of the ordinates of the current and voltage as outlined graphically.

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The Modification of Ohm's Law

Alternating, like direct current, may be calculated from Ohm's law but this law is altered by the addition of other factors which affect an alternating circuit but not one carrying direct current. Resistance to the flow of a direct current is made up of one factor only, the resistance of the wire forming the circuit, but when we come to consider resistance to an alternating current, we find it composed of two factors, the wire resistance or R that we found in direct-current calculations and in addition another form of resistance known as reactance which is caused by a counter voltage induced by the alternating current itself. This combined effect is known as impedance and is represented by

$$\sqrt{R^2 + r^2}$$

where

r = reactance;

and

R = ohmic resistance.

In direct-current calculations the wattage or power of a circuit was equal to the product of volts by amperes as $I \times E$. This is also true of a single-phase alternating current when the voltage and current are in phase or when they reach a maximum and zero point at the same instant. This will always be the case in an alternating circuit when the load is composed of resistance only, such as incandescent lamps or heating devices depending on ohmic resistance for their operation. However, if the circuit contains reactance, the current wave tends to lag behind the voltage wave as in Fig. 4. In this case, the current is said to be lagging and the power becomes less than the volts multiplied by amperes.

The percentage of true power to apparent power is known as the power factor. Thus, the power factor or

$$PF = \frac{true\ power}{apparent\ power} \text{ or } \frac{wattage}{I \times E}$$

As every circuit contains some reactance, we rarely find the power factor unity or 100 per cent. and if the entire load is inductive, such for instance as induction motors, it frequently drops to 70 per cent. or even to 60 per cent.

The lag in degrees, when a cycle is considered as 360 degrees, is usually represented by the Greek letter ϕ, in which case the power factor may be represented by Cos ϕ.

We find from the foregoing that the power in a single-phase circuit may be calculated as follows:

$$I \times E \times Cos\ \phi$$

In a similar manner, the power in a two-phase circuit and in a three-phase circuit are:

$$\textit{two-phase, wattage} = I \times E \times 2 \times PF$$
$$\textit{three-phase, wattage} = I \times E \times 1.73 \times PF$$

Alternating Current May Be Transformed

Alternating current, unlike direct, may easily be transformed from one voltage to another by means of static transformers and for this reason is used extensively, as the current may be generated at a low voltage and transformed to a much higher one for transmission over long distances, then transformed or stepped down to a working voltage again. The reason for this may be seen readily if we consider Ohm's law, since the wattage or power $I \times E$ remains constant, if we double E we divide I by 2 and have the same amount of power. Now, if we take half of I we may also reduce the capacity or size of our transmission wire by one-half.

From this relation, it may be seen that theoretically, we might transmit thousands of horsepower over a very small wire if the voltage was sufficiently high. In actual practice, an alternating current is usually generated at 2300 volts and is distributed throughout a town at this pressure. Wherever lights or power are needed, a transformer is installed reducing this voltage to either 110 or 220 and correspondingly increasing the current.

When it is necessary to transmit alternating current over long distances, we find that 2300 volts is not sufficiently high to obviate a large amount of drop in the wires. Therefore, it is necessary to raise the voltage to a point somewhere between 13,000 and 160,000, depending on the distance to be covered and the amount of power to be transmitted. Another factor in favor of high voltage is that a given drop in potential when deducted from a low working pressure is much more serious than when taken from a higher voltage. For instance, 10 volts dissipated in a 100-volt circuit is 10 per cent. loss while the same drop in potential in a thousand-volt circuit is only 1 per cent.

From the foregoing sketch of the characteristics of an alternating current, we see many factors in favor of its use and in fact we find alternating current plants making their appearance in mining operations even in the smaller sizes. The special features of this type of plant will be considered in a subsequent article.

Visit of J. Taffanel

J. Taffanel, mining engineer, former French inspector of mines, and now the director of the French mine experiment station at Liévin is the guest of the U. S. Bureau of Mines, and is collaborating with George S. Rice, the chief mining engineer, and others of the staff of the bureau in special tests at the experimental mine near Bruceton, Penn. Mr. Taffanel is known internationally for his original investigations of coal-dust explosions and the means by which they may be prevented.

He arrived in New York from France on Apr. 12, and proceeded immediately to Pittsburgh, where he has been busily engaged in the mine experiments and in studying the records of past tests at the experimental mine. Mr. Taffanel also went with Mr. Rice to Eccles to assist in his investigation. In 1907, on behalf of the French Association of Coal Operators, which had established the Liévin Station as a result of the great Courrières disaster of 1906, he came over to investigate the Monongah disaster. While here he studied on the ground the Darr and Naomi mine explosions. He has also investigated the important British mine disasters of recent years, including those in the Hulton and West Stanley collieries and the recent disaster at the Universal mine, Senghenydd, South Wales.

Besides investigating and testing safety lamps, explosives and mine-rescue apparatus at the Liévin Station, Mr. Taffanel has an organized crew of rescue men ready to assist at any mine disaster in Northern France.

In response to inquiry, Mr. Taffanel said:

I came to this country to study in collaboration with the Bureau of Mines and Mr. Rice some questions concerning the dangers of coal dust and the removal of the risk resulting from its presence.

I began to experiment on this subject in 1907, when the Coal Mine Owners' Association of France decided, some months after the Courrières Disaster, to organize the experimental station at Lievin. I have made up to the present more than 1400 explosions in the experimental gallery and collected many data concerning the relative danger of many coal dusts or coal and stone-dust mixtures. Although the experiments have been made on a big scale, in a gallery 1200 ft. long, the experiments at Liévin do not imitate exactly the mine conditions, and the results must be checked by means of comparative tests in an actual working.

I made such experiments last year, in an abandoned passageway of the Community mine, in France, but was obliged to stop after an explosion which destroyed a part of the passageway. Two months from today I will make tests of the same kind in another abandoned French mine at Montvicq. In the meantime, I was glad to be invited by the Bureau of Mines to follow the experiments in the Bruceton mine, which is perfectly equipped for such experiments.

I find a great profit in studying the important results obtained in this mine by Mr. Rice. Moreover, the experimental comparison of the Liévin and Bruceton results is doubly important, as it gives a confirmation of the Liévin determinations under the real mine conditions. We are able to combine the many data obtained at Liévin with those secured in the Bruceton mine.

Some years ago I designed the first form of arresting barriers, and these have proved, in many tests, to be effective for stopping coal-dust explosions. About a year and a half ago, I began studying new forms of arresting barriers, i.e., tanks or boxes, containing a great quantity of extinguishing materials, water or stone dust, and automatically opened by the air wave preceding the flame. Mr. Rice has followed allel studies and we find much profit in collaborating for the improvement of these devices.

The coal-dust danger forms a difficult problem and one of international interest. All countries which have undertaken to minimize this great danger must unite their efforts for meeting it as effectually and speedily as possible.

Carbide Lamps Freed from Suspicion

Gas and dust was the cause of the explosion which resulted in the death of Frank Hora at the Wheeling Creek (Ohio) mine of the Lorain Coal & Dock Co. at 2 o'clock, Jan. 27, 1914.

It was at first supposed that the residue from carbide lamps had caused the explosion; some of this residue was found in breakthrough 5, about 150 ft. from the center of the explosion. As a preliminary, pending the investigation, a temporary order was issued forbidding the miners of Wheeling Creek mine to use carbide lamps. The local Union passed a resolution demanding a thorough investigation and refused to go to work unless allowed to continue using carbide lamps.

In the meantime, Chief Mine Inspector Davies, Deputy Inspector Gaffney, together with Safety Commissioner of mines, Roan, of the State of Ohio, aided by other deputies, officials and experts were making a most searching in-

vestigation. It was soon demonstrated that as the residue left by the carbide lamps is merely slacked lime, it could therefore not be considered as a cause and it was proved conclusively that even had there been fresh carbide in the breakthrough, it could not have had anything to do with the explosion as the breakthrough was dry.

Carbide will not give off sufficient gas, when exposed to the air, to cause an explosive or even an ignitable mixture unless brought in contact with actual water. The moisture in the air is not sufficient to make enough acetylene to ignite. There can never be an accumulation of gas produced from carbide by moist air for the obvious reason that in order to produce gas, any air which has given up its moisture to produce acetylene must move on and the acetylene goes with it. The careful investigation of the location of the carbide residue showed that as a matter of fact, this residue was shut off from the butt entry in which the explosion occurred by a substantial brattice, the residue being located within 3 ft. of the adjoining butt entry in breakthrough 5, and as before stated with a brattice between it and the butt entry in which the explosion occurred.

Order Forbdiding Lamps Was Rescinded

When these facts became apparent, a meeting of the Local Union was called. The order prohibiting the use of acetylene was rescinded by the chief mine inspector, his deputies and the safety commissioner. This action resulted in great relief and satisfaction to all concerned. The investigation into the actual cause of the explosion continued. The work of the Ohio mine inspectors and the safety commissioner was supplemented by an investigation conducted by J. W. Paul of the U. S. Bureau of Mines. It was found that the explosion was caused by an accumulation of methane (firedamp) intensified by dust.

The thoroughness with which the Ohio officials have gone into the matter is indicative of the fact that that state has a very effective mine-inspection department, headed by Chief Inspector Davies. The new Safety Commissioner of Mines, J. M. Roan, was also tireless in his efforts to ascertain the real facts in the case.

Is Hookworm Rife in West Virginia?

As a result of the circulation of a letter from one of the officials of the United States Public Health and Marine Hospital Service to a physician in this state, to the effect that the hookworm disease is prevalent in the southern portion of West Virginia, Governor Hatfield has ordered the bacteriological department of the State University to go to the Pocahontas field and make a rigid investigation. The governor is indignant at the report and declares it is not true.

A little over a month ago, Dr. C. W. Stiles, the zoologist of the Federal Public Health Service wrote a communication, in which he declared that the hookworm was epidemic in the Pocahontas field and that the presence of this disease so generally there was due to the unsanitary conditions of the mining communities.

This matter was brought to the attention of the governor, who declined at first to believe that Doctor Stiles ever wrote any such letter. Later he learned that Doctor Stiles had made a similar report to the officials at Washington. Then he decided to act promptly and he made arrangements for the immediate dispatch of the bacteriologists to McDowell and Mercer Counties.

Declaring that he had practiced medicine in that section of the state for some years, and that he was more or less familiar with sanitary conditions, the governor did not hesitate to say that the report to the Federal Bureau and the statements contained in the Stiles letter were untrue.

But the chief executive did not rely upon his own knowledge. He communicated at once with the leading physicians in the Pocahontas field and asked them for information. The physicians in question and coal operators, with whom the governor had also communicated, began an investigation. A special meeting of the McDowell County Medical Society was called and held at Welch. At this meeting the doctors from the various mining communities of the county reported on conditions in their camps and as a result of these reports resolutions were adopted denouncing the hookworm statements.

In his letter Doctor Stiles said in part:

> I took a trip through the Pocahontas coal-mining region, in West Virginia, on one of the mine-rescue cars sent out by the United States Government. In brief, I found hookworm practically in every place that I visited, but, in general, the clinical appearances were not so marked as in some other portions of the South. The general sanitation of the mining district is very favorable to the development of the hookworm disease.

Some of the physicians worked with Doctor Stiles on his trip through the Pocahontas field. Among them was Dr. C. F. Hicks, superintendent of Miners' Hospital No. 1, at Welch. Doctor Hicks wrote to Governor Hatfield that he had gone through the district with Doctor Stiles. He declared that the Government expert was in the field only two days and that he helped him make tests. Twenty-five tests were made on patients in the hospital the first day and not a single germ of this disease was found. The next day Doctor Stiles visited coal mines in three communities in that section of the state and made a number of tests and found trace of the disease in only one test.

Doctor Hicks declares that Doctor Stiles expressed himself somewhat surprised at not finding traces of the disease and further informed the West Virginian that he believed plenty of the disease was there.

The operators engaged physicians to make reports on the sanitary conditions of the various mining camps and the governor ordered the staff from the State University. The operators have informed the governor that if the disease is there they will do everything in their power to stamp it out. Through their medical staffs the operators keep in close touch with the sanitation of their camps and are careful that the surroundings are healthful.

Governor Hatfield is emphatic in his declaration that the hookworm reports are slanderous to the state and he has ordered the scientists from the university to show just how groundless the reports are. Wherever persons are found to be suffering with the hookworm they will be treated. The governor is confident that only sporadic cases will be found.

By using high boiler settings and by bringing the furnace forward, provision is made for complete combustion before the gases reach the cool surfaces of the boiler. Thus smoke, soot and carbon monoxide are reduced, and more heat obtained. But the larger furnace needs adequate protection against heat radiation and air leakage and inspiration, or as much loss as gain will arise from the improved construction.—Bromley in "Power."

Notes on Australian Coal Mining

By Matt Brodie and P. T. Milligan*

SYNOPSIS—Description of some government-owned mines in Australia. Modern equipment is used throughout. The unusually irregular character of the coal has caused serious difficulties in mining, although the introduction of machines has greatly reduced costs. Frequent rolls in the bottom make it necessary to operate the machine in benches.

At Wonthaggi, Victoria, Australia, the state government owns and operates extensive coal mines, which are under the direct management of the Railways Commission in that state. These mines were opened in 1909 and now rank third among Australian producers of coal. They have supplied nearly the whole of the fuel required by the State Railway for three years past.

The state coal property covers an area of 5100 acres. About one-half of this has been very thoroughly prospected with diamond core drills, and has been shown to bear coal ranging from 2½ ft. to 6 ft. in thickness. The drills employed for this prospecting work were of the diamond core drill pattern, owned by the Victoria State Government, one of them being a class "H" 1000-ft. Sullivan Hydraulic cylinder machine. Since the beginning of this work, nearly 400 bore holes have been put down. During the two years ending June 30, 1913, 27,500 ft. of core borings were taken, in 104 bore holes, with an average depth of 264 feet.

The boring done during the last year proved that a lower seam of coal of workable thickness underlies a considerable area of ground north of the present workings. This discovery has increased the estimate of the quantity of coal, 30 in. thick and over, in the mine area, by some 1,500,000 tons, making a total estimated quantity in the area of 28,000,000 tons. Allowing 20 per cent. for loss in working, and deducting 1,434,000 tons, already extracted, the total still available for production is about 21,000,000 tons. The core borings are being continued to prove the remainder of the ground.

Longwall Machine at Work

Note the irregular character of the seam, which is 3 ft. thick at the machine and thins out rapidly to 18 in. on both sides.

The report of George H. Broome, general manager at Wonthaggi, for the year ending June 30, 1913, has recently been received. It is very complete and a model for such reports. The balance sheet shows a net surplus profit for the year of about $207,000.

Six Hundred and Fifty Acres Developed

The present workings cover an area of about 650 acres, developed by twelve shafts, all of which work the origin-

*Australasia Chambers, Sydney, N. S. W.

ally discovered or upper seam, which is about 235 ft. from the surface. The coal varies from 2½ to 6 ft. in thickness, and is irregular, the entire area being badly broken up by faults. The roof ranges from sandstone to soft shale, and even to material much broken and as soft as mud. The changes occur sharply, making the problem of mining and of sustaining the roof a difficult one.

The output of the mines is hoisted from three shafts, Nos. 5, 9, and 10. There is but one tipple and coal-handling plant; namely, the one at No. 5, which was enlarged during the past year to handle the entire output of the three mines. The coal from the shafts Nos. 9 and 10, some 450 ft. distant, is conveyed above ground to this point by means of an electrically driven endless rope.

The gross tonnage for the year was 462,588 tons. Of this amount, 258,249 tons were screened, 9239 tons unscreened, and 190,163 tons slack coal—a total of 457,651 tons shipped, of which all but 17,000 tons of screened coal was furnished to the State Government Railway. Ten thousand six hundred tons were furnished to various public departments and 171,000 tons of slack coal only were disposed of to the public. The average number of employees during the year was 939, comprising 468 coal miners, 250 other miscellaneous underground employees, and 221 surface men. The mine worked 260 days during the year, on a basis of two shifts.

The average earnings of the miners were $3.23 per day, after deducting the cost of explosives and light. There was but one fatal accident during the year, this being due to a fall of coal at the working face. Underground miners are paid chiefly on a tonnage basis.

Mining Methods

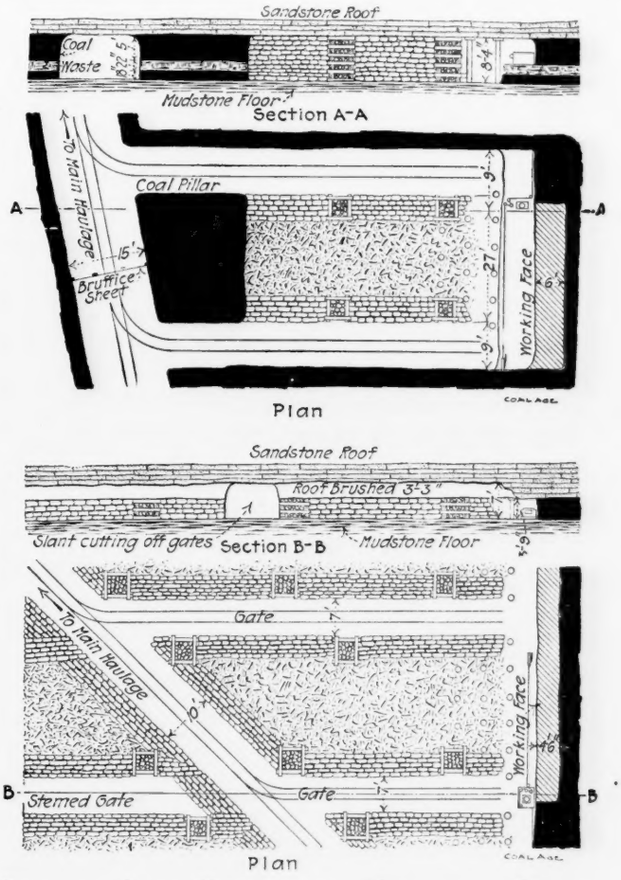
The accompanying illustrations show two typical methods of mining at Wonthaggi, although, as stated, the great irregularity of the seam makes it difficult to adhere to a given system, as the work progresses from one part of the mine area to another. The sketches show the characteristic methods of working at Nos. 9 and 10 shafts. At present, these two shafts are producing about one-half the output of the mine, and practically the whole of this coal is being mined by coal-cutting machines of the Sullivan electric room-and-pillar and longwall patterns. The upper sketch shows the method of working in No. 9 shaft, where the coal is about 6½ ft. high, with a 22-in. dirt band, 18 in. from the floor. As indicated, the method of working is by the "double stall," with stalls or rooms 42 ft. wide, and two gates, or, as they would be called in this country, room necks, with a track in each.

The coal is first mined with a Sullivan room-and-pillar machine, class "CE-7," on the top of the dirt band, the depth of undercut being six feet. The upper five feet of coal is then shot down and filled away or loaded. The dirt band is next lifted and thrown back into the gob; and lastly, the lower 18 in. of coal is raised and loaded out.

In No. 10 shaft working, where the coal is much lower, averaging about 3 ft. 9 in. in thickness, the longwall method is in vogue. A gate or entrance seven feet wide is provided every 33 ft. for handling the machine and loading out the coal, the space between being filled with packing to support the roof.

The broken nature of the seam is shown by the illustration of a Sullivan longwall machine in operation at No. 5 mine. Where the machine is, the coal is three feet high. A few feet away to the right and left, it is but 18 in. thick.

A new opening or slope, known as the McBride Tunnel, is being driven at a gradient of 1 in 5½, for the development of the area lying to the north of the present workings. It is now several hundred feet in from the entrance, and its object is to cut four successive downthrow faults in the present known seam. This will enable the coal to be extracted from four different levels



Sketches Show Two Typical Methods of Mining

in about three-quarters of a mile of tunneling. The objective point of the tunnel is the lower seam of coal mentioned above, in the northern portion of the area.

Surface Plant

The mines are equipped with the most up-to-date machinery, on the surface as well as underground. The total value of the plant is nearly one million dollars. Electric hoists are employed to raise the coal at the three working shafts. Electric power for the hoists, coal-mining machines, rope hauls, pumps, fans, etc., is generated from a central station, which includes a battery of eight boilers fitted with underfeed stokers for burning slack, two generating sets driven by reciprocating engines, and a horizontal turbo-alternator. Current is generated at 5200 volts. The electric power is distributed from this plant to the different mines, where transformers and rotary converters are located, for operating the coal-handling machinery, screen, hoists, tipples, etc.

At the Nos. 9 and 10 shafts a change house and bath rooms were provided for the workmen during the past

year. The building is of wood and corrugated-iron construction, with a concrete floor, and accommodates 400 men. Forty shower baths are provided, with an ample supply of hot and cold water. The workmen's clothes are dried by steam heat. They are attached to hooks, which are handled by chains passing over pulleys on the rafters, so that they may be raised into position for drying.

Mr. Broome's report for 1912 stated, in regard to the Sullivan coal cutters:

"These machines are working satisfactorily on the long-wall faces, where the coal is from 2 ft. 6 in. to three feet in thickness. Under these conditions, they are effecting a saving in cost of about one shilling per ton, compared with hand mining, and in addition to this, recent tests have shown a reduction of ten per cent. in slack, from the machine faces, which at the present selling price means an increase of over 5 pence per ton in the value of the product."

During that year three machines were in use, while the year ended June 30, 1913, eleven Sullivan machines were in operation.

In all, the Wonthaggi mine now owns about 25 Sullivan continuous coal cutters, of which 17 are of the long-wall pattern.

The 1913 report shows that these state-owned mines are hoisting 2200 tons per day of two shifts.

Mount Kembla Colliery

While there are many American coal cutters of the Sullivan continuous-cutting pattern, in use in the various Australian mines, the following mention is of particular interest, because the machines concerned are of the new alternating-current ironclad pattern. Three of these machines are in operation at the Mount Kembla colliery, South Coast, New South Wales, Australia. The average cutting of these machines is about five places per shift, including 5-yd. headings and 8-yd. rooms or bords. An interesting feature of mining at this colliery is that of cutting the coal on canches (benches). This is due to the frequency of rolls of hard stone in the floor of the mine. These rolls are ordinarily quite gradual, and it is customary to drive the rooms along the floor of the trough, causing the crest of the roll to come in a pillar wherever possible. Where the rolls are sharper, varying in height from 18 to 24 in. above the regular level of the floor, the canches are worked ordinarily about 30 in. above the bottom. The total thickness of the seam, it may be stated, is about 6½ to 7 ft. and it is nearly flat.

In order to operate on these canches or benches, the Sullivan ironclad machines are mounted on special trucks, raised to a height of 2 ft. 9 in. above the floor. These are built up by two pieces of 12-in. I-beams, placed horizontally between the wheel-base frame and the truck frame. The canches are carried about the depth of one machine cut, namely, 6½ ft. back from the face, so that when the coal is blasted down after undercutting, most of it remains on the canch, from which it is loaded direct into the mine cars, thereby saving the labor of lifting the coal from the floor to the top of the car. An individual miner can fill as high as 20 tons in a shift, off one of these benches.

Before the continuous-cutting Sullivan machines were installed, American breast machines had been tried and the greater length of these made it necessary to keep the canch or bench much farther back from the face than is now the case; namely, from 15 to 20 ft. It was, therefore, necessary to handle the coal twice; the face shovelers throwing it back to the edge of the canch, from which point it was loaded into the cars.

With the new alternating-current ironclad machine, the cutting speed in this mine averages 16½ in. per minute, and the average load taken is 40 amp. In some parts of the mine, where the rolls are gradual, the machine follows them, and the canch system is not necessary.

The ironclad machine is driven by a 30-hp., 3-phase, 440-volt, 60-cycle, squirrel-cage induction motor, with a star-delta controller for starting. The motor is gas proof. The advantages of using alternating current at this mine are enhanced by the fact that it is 2¼ miles from the tunnel mouth to the working face, so that much higher efficiency is secured in transmission than would be possible with direct current.

Meeting of Anthracite Section of A. I. M. E.

The Pennsylvania Anthracite Section of the American Institute of Mining Engineers held a meeting in the auditorium of the Lehigh & Wilkes-Barre Building, Wilkes-Barre, on Saturday evening, May 9. Douglas Bunting read a paper entitled "Mining under Heavy Wash." Following the reading of this paper, there was a discussion of the subject by Messrs. Hill, Stearns, Norris, Griffith, Engle, Smith, Otto and Foster.

It was the consensus of opinion of all the members present that the problem of mining coal under heavy wash is a matter of much interest to anthracite people, and is a subject that has not been developed in recent years to an extent its importance justifies.

At subsequent meetings of the Anthracite Section, further discussion of Mr. Bunting's paper will take place, and there is no doubt but that such a broad consideration of the problem will furnish the mining industry with much information of a practical and valuable nature.

At this same meeting, John M. Humphrey was to read a paper on "Stripping." Mr. Humphrey's absence through illness, necessitated the postponement of this latter paper.

The Anthracite Section of the A. I. M. E. is proving to be a healthy branch of the parent organization, and it is expected that this newly organized body of coal-mining men will accomplish much work of a beneficial and lasting nature.

Erratum

On p. 773 of our May 9 issue, a photograph was published, under which appeared the following caption: "These Four Strike-Breakers Were Killed the Day after Picture Was Taken." It seems that the photographer on the ground who secured the picture was either misinformed or deliberately misstated the facts in the case. One of the men in the picture, Evan Jones by name, writes us, stating that he is very much alive and that the only one of the four men who was killed was a blacksmith by the name of Newman. Mr. Jones says that he was not a strikebreaker, having been employed by the Rocky Mountain Fuel Co. as their mine examiner.

Construction and Operation of Mine Substations

By H. Booker*

SYNOPSIS—Substations, when possible, should be located on the surface, because if placed underground there is danger from fire, dampness weakens insulation and causes corrosion of metallic parts. Underground substations are more costly to construct than those located on the surface as the mine roof is weak and should be arched or built of heavy concrete, the station being made fireproof throughout.

There is a growing use of electricity in coal mines, especially during the last two or three years, due to the introduction of central-station power which, strange to say, can be sold to a coal mine cheaper than the mine can produce it itself.

The greatest care should be exercised in the introduction of electric power in a coal mine and the best advice should be obtained. Electric power improperly installed and not properly operated and maintained will no doubt prove a hazard and just such conditions are causing apprehension in some localities regarding the use of electric power in mines.

Does Not Pay to Install Poor Machinery

The danger and unsatisfactory service associated with electric power in the past, has been largely due to the short-sighted policy of the coal-mining companies in purchasing cheap equipment unsuited to the service and in employing incompetent labor. A coal mine is the last place where inferior or poorly designed electrical apparatus should be used, as the risk of trouble is too great.

Even with the best designed and adapted equipment the question of operation and maintenance is one which is often sadly neglected. The matter of compensation is often allowed to play too prominent a part, and the wages offered are such that it is impossible to obtain competent men who will take care of the plant and who will realize the importance of maintaining the apparatus in proper condition.

Rigid, systematic and careful tests should be made periodically on all moving parts of electrical equipment to insure proper operation and records kept of these tests for future reference.

Isolated Plants vs. Central Stations

Until quite recently the electric power in use at coal mines was produced by small isolated plants located at each mine. With the large increase in production and the combination of many small mines, the introduction of central plants and the purchase of central-station power is rapidly gaining ground.

The use of power from a central plant, or of purchased power, requires a substation to supply direct current to operate the mine locomotives, cutting machines, underground pumps and lights. A mine substation, in general, consists of one or more motor-generator sets or synchronous converters used to transform high-voltage alternating-current power to direct current at 250 or 500 volts.

The small isolated plant was generally placed near the mine mouth, provided the coal and water supply was convenient. As the capacity of the mine increased and the distance to the working face became greater the power conditions became unsatisfactory. An increase in the capacity of the existing plant often means a large expenditure of time and money, so that the purchase of central-station power and the installation of a substation offers the best solution. The substation can generally be placed at a more advantageous point than the isolated plant because a substation is independent of the supply of coal and water. An increase in power supply at any time can be easily and quickly provided at a low cost.

Substation Requires Little Care

Substations when properly designed and installed require little attention, and the attendant is needed only to reset circuit-breakers and to see that everything is running properly. If power is not wanted the machines can be cut out and all expense for current stopped. Starting up is a simple matter of closing a switch and full power is available immediately.

The combination of purchased power and the substation system of power distribution is most advantageous for coal companies operating single or widely separated mines. The operator transfers his responsibility to those whose business it is to carry it, leaving him free for his business of mining coal, thus relieving him of the worry and care of his power plant, and thereby greatly increasing the efficiency of his coal-mining department. The operator substitutes his power house with its engineers and firemen and its need for good and abundant water, with a small substation that requires only one attendant and no water supply.

Where Substation Should Be Located

The exact location of the substation is often a hard question to decide. Conditions frequently arise where it would be desirable to install the substation underground, but in general, unless absolutely necessary, the substation should be placed on the surface. The preferable location is at the mine mouth when possible, as it can then be attended by a workman who has other duties to perform. In a small mine the tipple foreman can attend to the station, while in a shaft mine the station should be located in the hoist room and kept in operation by the hoist engineer.

In a large mine requiring more than one station, all substations should be located at working centers to save the expense of heavy copper feeders. The substation can often be located near the fan so that the same operator can look after both. When the direct-current feed wires cannot be carried into the mine by one of the openings, boreholes can be used, as it is comparatively simple to maintain a 500-volt cable installed in a borehole.

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Note—Article read before the 293d meeting of the American Institute of Electrical Engineers, Pittsburgh, Penn., Apr. 10, 1914, under the auspices of the Committee on the Use of Electricity in Mines.

Keep Substations on Surface

There are many objections to locating the substation underground. Beside the danger from fire there is almost always much dampness underground which not only weakens the insulation, but causes corrosion of unprotected metallic parts. It is practically impossible to make an underground substation free from moisture, and sufficient ventilation is often difficult to obtain. A suitable current of air is important, for the heat losses in the apparatus must be carried away so that the capacity of the machines will not be impaired. That this heat is not negligible will be readily appreciated when it is considered that the loss of one kilowatt per minute is equal to 57 B.t.u., which is equivalent to heating about 3001 cu.ft. of air 1 deg. F. per minute. The total loss in a 200-kw. station will be approximately 15 kw. The heat generated will, however, help to keep the substation dry in conjunction with proper drainage and pumping.

Use Intake Air in Substation

All underground substations should be ventilated with intake air and all high-tension cables should, when possible, be carried to the substation in the intake airway. This may work a hardship, particularly if the mine is operated from a shaft and a blowing fan is used, as it is practically impossible to maintain wires in a shaft of this kind on account of the high air velocity. I know of mines of this type where it is unsafe for a man to attempt to ascend the stairway, much less do any work while the fan is in operation. Often much coal dust and pure sand are picked up by the air currents and play havoc with the bearings and oiling systems.

The cost of construction of an underground substation is considerably greater than that of such a building on the surface. Since there is always danger of the roof giving way, it should be arched or built of heavy reinforced concrete and the whole station made fireproof. For a 200-kw. substation the dimensions should not be less than 24x24 ft. and the height 12 ft.

Low-Tension Cables Are More Easily Maintained

With the substation located underground it is generally necessary to carry a high-tension cable through a bore hole. With the station located on the surface a low-tension cable suffices and it will be no trouble to maintain. A satisfactory method is to use "lead" covered cable attached to a messenger cable about every 30 ft. by wiped joints or suitable clamps, which will not injure the lead. The high-tension cable is difficult to maintain in deep shafts and boreholes.

Actual experience has taught me that it is impossible to get attendants underground to give machinery the same care they will give it on the surface. There is a greater tendency among men to sleep on the night shift in mines, than on the same shift outside. This may be due to the mine atmosphere, which is often contaminated with gas from gob workings.

In the general design and construction of a mine substation, economy of space should be given consideration, but care must be exercised to see that there is plenty of room for making repairs and replacements. A substation may be required to provide service for a few hours per day or practically without a break. As due provision must be made for inspection and repairs, it is evident that in case of continuous operation, attention must be given to the sectionalization of the apparatus and the duplication of the equipment.

As the consumer will naturally want to supervise the operation of his own station, it is evident that any complications in switching equipment and control apparatus should be avoided. The substation should be constructed of fireproof material, and all high-voltage apparatus should be inclosed to secure maximum safety to attendants. Asbestos lumber should be used for partitions and doors. This serves as a protection against shock and is valuable protection in case of fire.

The common faults in electrical installations of this kind are as follows:

Exposure of high- and medium-pressure conductors at the surface and high- and medium-pressure switching gear underground. The frames of high- and medium-pressure apparatus not properly grounded. (All machine frames should be well grounded.) Switches, cables, rheostats, starting boxes, etc., mounted on wood and surrounded by as much wood as possible. (Such defects in method cause first, a shock when somebody comes in contact with an exposed live part; second, fire due to defective joints in cables.) Omission of tubes, where frames of machines and brattices are pierced by cables.

Defects in Organization

The common defects of organization are as follows: The absence of trained electricians. The handling of live wires or apparatus for adjustment or repair when not absolutely necessary. The absence of a definite and distinct rule that unskilled men may handle electrical cables and apparatus only when the power is off.

The use of central-station power will no doubt bring the operating force at the mine in close touch with the central-station operating force which is always ready and willing to advise the coal operator in regard to his installation and operation.

It is to be hoped that improved legislation and a better coöperation between the mining companies and the Bureau of Mines will greatly increase the safety and improve the operating conditions in connection with the use of electricity in mines.

The World's Coal Production

Wm. G. Gray, statistician of the American Iron and Steel Institute, estimates the world's coal production for the years 1911 and 1912 as follows in metric tons, except where otherwise noted:

Countries	1911	1912
United States	†443,188,505	477,202,304
Germany and Luxemburg	234,521,254	255,810,094
Great Britain	†271,891,899	260,416,338
France	39,229,591	41,308,580
Belgium	23,053,540	22,972,740
Austria*	40,414,914	42,934,500
Hungary	9,444,741	9,587,276
Russia	28,007,239	30,641,163
Sweden	311,809	360,291
Spain	3,915,672	no statistics
Italy	557,137	663,812
Canada	‡11,323,388	14,512,829
Transvaal	†3,878,286	
Natal	†2,392,456	
India	†12,715,534	14,706,339
New South Wales	†8,691,604	9,885,815
New Zealand	†2,066,073	2,177,615
Victoria	†659,598	593,155
Tasmania	†57,067	53,560
Western Australia	†249,890	295,079
Queensland	†891,568	902,166
Japan	17,632,710	19,639,755
Formosa	254,921	278,455
Corea	123,668	
Other countries—partly estimated	**22,814,386	22,807,421

*Includes Bosnia and Herzegovina. †Gross tons. ‡Short tons. **Metric and gross tons.

Surveying Methods of the Madison Coal Corporation

By G. E. Lyman*

SYNOPSIS—Typical surveying practice in the Middle West. Some important notes regarding the relative accuracy required under varying conditions are given. Both inside and outside methods are described, together with office computations and map work.

The mining operations of this company are conducted in widely separated coal fields, consisting of about four thousand acres each, it being about two hundred miles between the extreme territories. Each field is worked by one or two mines, and it is accordingly necessary to handle each by itself, it being impracticable, as well as unnecessary, to correlate the surveys of the different fields. Therefore, each has its own set of coördinates, base lines, etc., making each coal field with its own mines, a complete unit to itself.

All the mines are at present working in the No. 6 seam, which, with few exceptions, lies so nearly level that corrections for vertical angles are rarely required, the average grades being considerably under one per cent.

Maintaining a Consistent Standard of Accuracy

These conditions largely determine the methods necessary to attain the degree of accuracy desirable for the work. The fixing of such a standard is an important point, as otherwise a great deal of inconsistency will characterize different parts of the work. Nothing is more incongruous, as well as expensive, than the use of extreme refinement at one stage of the work, only to lose all benefit therefrom by subsequent looser work. If transits are used, reading down to a few seconds, temperature compensated-tapes and spring-tension handles should also be employed. Such refinement, however necessary in long tunnel and extended triangulation operations, and fascinating in itself to the engineer, is entirely out of place in the ordinary daily run of mine work.

In the routine work herein described, it has been the effort to confine errors to one in six thousand, and to keep all operations of the survey relatively consistent for the attainment of such results. Transits with plain verniers reading to single minutes are employed, which by interpolation can be read to the nearest half-minute, if desired. Ordinary traverse work is read to minutes. Tapes are graduated to single feet, and are used in lengths of 100, 200, and occasionally 500 ft. The first and last foot is graduated to tenths, and when necessary to measure to hundredths, a pocket scale can be used. Long distances are measured to tenths, shorter ones to hundredths. Office calculations are uniformly carried to hundredths. Adherence to these standards gives results often far within the permissible margin of error. Probably the only exception to the above routine is in shaft plumbing.

The surface survey consists primarily of a traverse of the land corners, with such supplementary work as necessary to locate streams, roads, railroads, buildings, and the other items which go to make up a complete topographic survey. Some of the surface is so level that sights of a mile may be readily taken, and in such cases a plain traverse survey gives good results. When it is too hilly, triangulation is resorted to.

Surface Monuments, Instrument Work and Chaining

Permanent surface monuments are established, consisting of iron pins set in concrete, and where practicable, three are used, so as to detect any disturbance in their angular relation. It is desirable that one of these permanent stations be set sufficiently close to the shaft to permit of its use in the shaft plumbing. Similar groups of monuments, established in outlying districts of the field, enable surveys to be started from them at will. All permanent monuments are carefully tied in by closed surveys.

All traverse work is run with the continuous vernier, the azimuth being read directly off the plate and recorded in the field book. The bearing is next read by the opposite vernier, and recorded. Then, and not before, the transitman compares the two records as he has written them down, and if they check, he knows the verniers have been correctly read. When moving ahead, the upper motion is never released, and after taking his backsight the transitman again reads his vernier to make certain it has not been disturbed before turning on the station ahead. At intervals the vernier readings are checked against the needle, which would disclose any error of magnitude, although except for this approximate check the needle is never employed. When the above routine is faithfully followed, errors in instrument work will be few and far between.

The measurements are carefully taken between stations along the line given by the transit, and where there is no opportunity of closing the traverse or tying it in to a permanent monument, the distances are checked by rechaining in the opposite direction. It is generally in the measuring that the most errors occur. Young engineers, in their anxiety to become instrumentmen, are prone to overlook the careful and concentrated effort necessary for accurate chaining, and the chainman who realizes the importance of this work, and who is able to handle it accurately and with dispatch, is a jewel of the first water. A single wrong plus, taken by a man with his mind on other things, can easily cause more trouble than he is worth. All distances between stations are recorded as individual measurements, continuous chaining, as in railroad work, never being used.

Underground Work

The transference of the azimuth and coördinates of the surface survey to the underground workings, in the case of shaft mines, such as those under consideration, requires the most careful and painstaking work. Each mine has at least two shafts and the method of single wires in each is adopted as affording the greatest accuracy. An effort will be made in a subsequent article to outline the details of this operation.

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The underground survey is carried forward by the same traverse methods as already described for the surface work, making only such variations as necessitated by the changed environment. The stations are all set in 1-in. wooden plugs, driven firmly into holes drilled two or three inches into the roof. Timbers are used only when the nature of the roof makes it unavoidable. The transit is set under the station, the telescope being centered on top for this purpose. Sights of ordinary length are taken on the string of the plumb-bob, and those of greater distance are taken on the point of the bob. Carbide lamps are used, on account of their excellent illumination, all the mines being worked with open lights.

Stations are set in the rock roof where possible, considerable time being taken to so place them, since their permanancy makes it well worth the extra time and trouble. Sights as long as 1600 ft. have been taken underground, but on account of the difficulty of handling them, sights over seven or eight hundred feet are seldom used.

The entry sights, or "pointers," as well as all sights for connections and other special work, are set by the engineers, and where the roof is good, consist of two points, about three feet apart, set in the slate or rock top, from which plumb lines may be suspended for sighting ahead. Where necessary to use entry timbers, three and often four points are set, so any movement may be detected before the entry gets off line.

The uniformity of the seam makes it possible to project the workings far ahead of actual mining. When within a reasonable distance of the place to turn a new entry, the mine manager is given written instructions which enable him to mark off the correct location by measuring the proper distance from the last pair of entry sights. As soon as it is ready, an engineer sets the sights for the new entry to conform to its projected location. These entry sights are tied in to the traverse work and are advanced about every 200 ft. At the proper interval, one point will be converted into a permanent station and again carefully tied in to the preceding traverse. The distance and azimuth are compared with the record of sight extension, and if any discrepancy exists it is at once investigated.

Room Sights and Tie Surveys

At each mine there is one man who is directly charged with the duty of watching the entry sights set by the engineers, seeing that they are kept on the lines designated, and in case of accident affecting the sights he sets temporary ones until they can be reset by the engineer. This man works as an assistant to the mine manager, and with a transit sets the sights for the rooms as fast as they are necked. All rooms being turned at right angles to the entry this is a simple process, and one with which trouble is seldom experienced. He further sees that all places are stopped when driven the required distance, and when finished, measures them up, notes the crosscuts right and left, and places the information on a report which goes monthly to the engineering department. This is used afterward for checking purposes in a manner described further on.

Advantage is taken of every opportunity to close portions of the traverse between different parts of the mine, and thus obtain the only possible mathematical check on the work. In important cases where a closure is highly desirable and it is not deemed wise to connect the workings, satisfactory results are readily obtained by advancing the faces to within 10 or 15 ft. of each other and putting through a 2- or 3-in. drillhole, thus allowing the survey to be closed. A little cement mortar readily closes the hole when it has served its purpose. Large drill holes from the surface, to accommodate pump discharges and other purposes, afford an excellent opportunity of checking the coördination of the top and bottom surveys, while an occasional connection between adjacent mines offers the severest test of all, involving as it does two sets of shaft plumbing.

Levels

Levels are required by the law of Illinois to be shown "at reasonable intervals along the main and cross entries," the elevations being referred to the base of coal at the hoisting shaft. The advantages, however, of having them referred to the bench marks of the United States Geological Survey, and being able to use them in connection with the topographic sheets, are sufficient to warrant two sets of maps, if necessary—one to comply with the letter of the law, and the other for practical working purposes.

In taking the entry levels, the main entries are first carefully chained, continuous notes being kept, entirely distinct from the traverse work. Accurate plusses are taken to all cross-entry switches and to all permanent stations of the traverse survey. As opportunity permits, the distance between permanent stations is figured from these continuous chaining notes and compared with the distances recorded in the traverse book, affording an additional check on the mensuration. In the cross entries the same method is followed, the chaining being picked up from the plus to its switch and carried ahead continuously to the face. The advantage of this lies in the fact that it is thus possible, without any rearrangement of notes, to plat a continuous profile of any haulage road from the main shaft out to the face. A 22-in. wye level is used, and elevations taken every hundred feet, ordinarily, along the top of the rail. Elevations of permanent stations are taken to serve as benchmarks, and advantage taken of all connections to close the work.

Map Extensions and Office Computations

Complete measurements for map extensions are made at intervals varying with the working time of the various mines. This is mostly done independently of the traverse and sight-setting work, generally after the latter have just been extended all around. The entries, as a rule, are held so rigidly to the sights set by the engineers that little more is necessary than to locate the crosscuts and room necks. This is done by measurements from permanent stations of the traverse survey, and at the same time any necessary side measurements are obtained. The rooms are measured, the crosscuts located, pillar widths obtained, and if the room has got off the sights its bearing is obtained by a Brunton pocket transit, care being taken to observe the magnetic bearing of the entry and room from the same point, so as to eliminate errors of local attraction. Any work which may have gone badly out of line is located by a traverse survey, and an effort made to place the responsibility for same where it belongs. Details of ventilation, location of doors, motor partings, pumps, and miscellaneous information of like

character are obtained at the same time, and at more or less frequent intervals the height of the working faces is taken to check the tonnage extraction.

In the office, the traverse notes are transcribed from the field book into the survey record sheets, copy of which is shown herewith. Any distances which may have been measured on a sufficient angle from the horizontal to materially affect results are first reduced to horizontal measurements. Each entry has its separate sheet, and each mine its individual loose-leaf binder. The sines and cosines are first worked up by Gurden's traverse tables and entered on the record. The natural functions of the bearing are then placed on the record, and multiplied by the distance with a Thatcher slide rule, of the large cylindrical type, which will readily handle to two decimal places any distance less than a thousand feet.

The results obtained by these two methods are compared as they stand on the sheet, and any discrepancy checked by another man. When correct, each is given its plus or minus sign, everything north and east being plus, and those south and west, minus. Their algebraic sum then gives the longitude and latitude of each station, or as it is often called the "latitude and departure." The algebraic addition is checked, the sheet O.K'd, and indexed. In the column for remarks, closures are noted, references given to other sheets, and any other information recorded.

Closures of simple underground circuits are frequently made with an error of not less than one in ten to twelve thousand, while surface and underground closures by means of drill holes often come within the eight thousand limit. Connections with adjacent mines, through two sets of shaft plumbing have been made with an error of one in eight thousand.

MADISON COAL CORPORATION

Coördinates of Mine No. 5

Location 13th and 14th North—Main East Date September 20, 1913

Line	Distance	Azimuth	Bearing	Natural Sine	Natural Cosine	Slide Rule L. Sin O	Slide Rule L. Cosin O	Traverse Table L. Sin O	Traverse Table L. Cosin O	Longitude	Latitude	Station	Remarks
392–432	353.90	00° 02′	N00° 02′E	0.00058	1.00000	+0.20	+353.90	+0.20	+353.90	+7139.78	—1364.88	432	Opposite 2nd E - 14th N
432–461	350.80	00° 11′	N00° 11′E	0.00320	0.99999	+1.12	+350.80	+1.12	+350.80	+7140.90	—1014.08	461	Opposite 3rd E - 14th N
461–434	58.30	356° 58′	N 3° 02′W	0.05292	0.99860	—3.09	+ 58.21	—3.09	+ 58.21	+7137.81	— 955.87	434	Opposite 4th E - 14th N
										+7137.60	— 955.82	434	Closure from 12th N - Main East
										0.21	0.05		Error of closure

Map Work

The coördinate maps are made on the best obtainable quality of heavy, cloth-mounted drawing paper, and as a rule are on a scale of 200 ft. equals 1 in. The sheets are laid off in squares two thousand feet each way, properly designated, and the location of each station platted on from the office record sheets. The platting is checked by scaling the distances between stations and comparing with the actual length of the course. All underground survey lines are shown in red, and form the framework around which is drawn the mine workings in black. The work of each fiscal year is given its color, and dated. Should it happen that any place has become inaccessible for measurement when the engineers were making their extensions, reference is had to the mine reports previously mentioned and the place shown in accordance therewith, in dotted lines, to differentiate it from the work of the engineering department. These reports are further checked over in detail against the newly extended maps, and any discrepancies investigated.

Tracings are extended with the coördinate maps, and prints furnished the various officials. Once a year maps are filed in accordance with law with the State Mine Inspector, State Rescue Stations, and the County Recorder. Small scale maps of the different coal fields are made for those officials who would find the larger ones cumbersome, and in making such reductions the pantograph, photography and proportional dividers are employed. Photography is frequently used in place of, or to supplement drawings, with excellent results.

The mine projects are always kept on separate tracings, and prints furnished those who have need for them. These are made on a scale of 200 ft. equals 1 in., the same as the mine maps, and photo reductions are made and attached to the field books of the various mines.

Separate tracings are made and extended yearly to show the outline of the worked out acreage. This tracing is carefully adjusted over the coördinate map, and a line drawn around the faces. The areas are then measured with a planimeter, and entered on the tax-record sheets. These sheets show the worked out and remaining acreages by quarter sections, and furnish the necessary data by which the district superintendents make the yearly returns to the assessors. This method of handling prevents absolutely the possibility of overlapping measurements from year to year, and furnishes a permanent record of the worked out areas.

From the data now available, statements are prepared showing by mines and coal fields the areas mined out and remaining, percentages of extraction, and other information required by the executive departments in preparing their annual statements.

Recent Legal Decisions

Amount Recoverable For Loss of Eyesight—Where a mine pumpman lost his eyesight in an accident attributable to negligence on the part of his employer, $1000 was not excessive recovery. (Kentucky Court of Appeals, Stearns Coal & Lumber Co. vs. Tuggle, 164 Southwestern Reporter 74.)

Liability for Viciousness of Horse—A retail coal dealer, whose delivery horse bit a pedestrian while the latter was passing along a sidewalk, is not liable for the accident, unless the dealer previously had notice of the horse's vicious tendencies. (Massachusetts Supreme Judicial Court, Dix vs. Somerset Coal Co., 104 Northeastern Reporter 433.)

Liability for Injury to Miner in Kansas—Under the Kansas Mine Law, which requires the owner or operator of a coal mine to employ a mine boss to make inspections to promote the safety of employees, an operator is liable for injury to a miner attributable to non-compliance with the law. (Kansas Supreme Court, Baisdrenghein vs. M. K. & T. Ry. Co., 139 Pacific Reporter 428.)

Legal Right of Miners to Strike—Recognizing the right of every employee to quit work when dissatisfied with the conditions under which he is working, where he is not bound by contract for a definite term, without assigning any reason, and recognizing the right of any number of workmen to do collectively what they might do individually, it is held that neither a union of mine workers nor its members are liable in damages to a nonunion miner who is discharged under threat of the union men to quit unless he should be discharged. (Oklahoma Supreme Court, Roddy vs. United Mine Workers of America, 139 Pacific Reporter 126.)

The Explosion at Eccles, W. Va.

By R. Dawson Hall

SYNOPSIS—A well conducted mine with men both in charge and at work having a more than usual sense of responsibility blows up at Eccles, Raleigh County, West Virginia, killing 180 men. The company operating was strict in its discipline and careful in its management. Operating changes are described which will make the mines safer in the future. It is not safe to rely on ventilation and sprinkling in a bituminous-coal mine which generates gas.

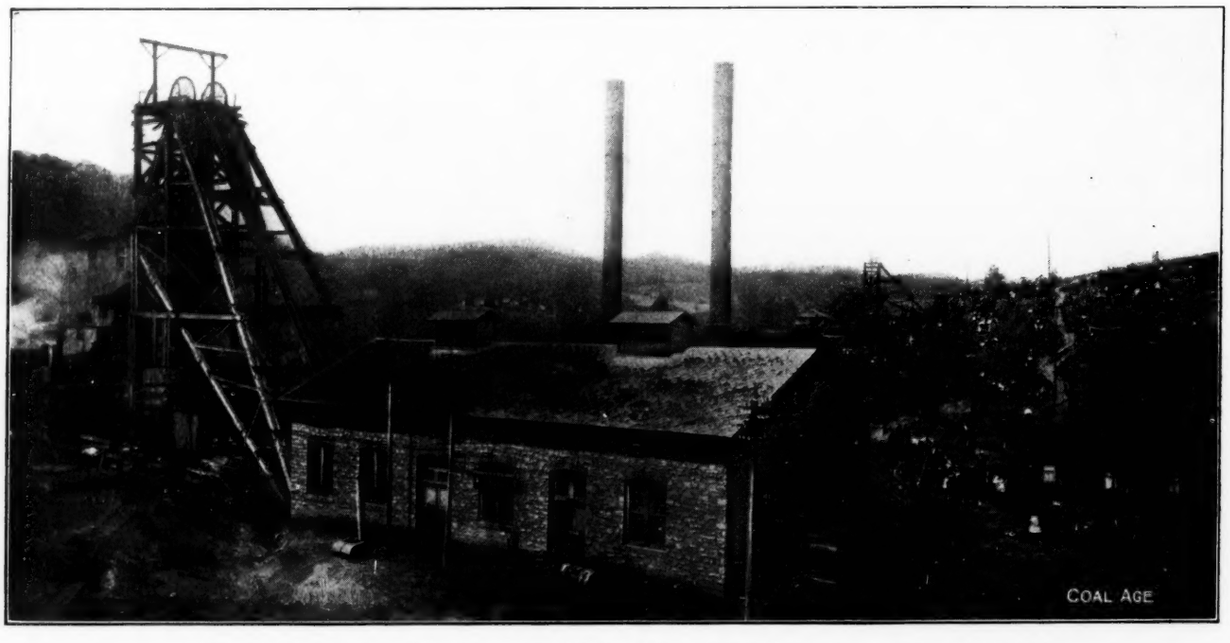
The Eccles explosion in the mine of the New River Collieries Co. exhibits clearly the inevitable dangers of mining and should teach important lessons to operators. It should be followed by some drastic legislation and this should be advocated by the coal-mine owners, no less than by the men. When in ordinary industries one man commits a folly, he is injured or killed. In coal mining, not only he himself is killed, but all his coworkers. There is, therefore, hardly a business except powder making or railroading in which stringent precautions are more absolutely necessary.

The law is wholly inadequate; the Eccles authorities realized this and supplemented it in many ways, and hereafter they intend to be even more careful and it is only just that their competitors in business should be compelled to take precautions assuring equal safety. For excessive caution inconveniences and alarms the workman, and he does not like to work in the mines where he is thus handicapped or where the precautions adopted remind him hourly of the risks of the employment in which he is engaged. He would sooner face those risks unguarded in mines where they are less frankly acknowledged, though not less certainly existent.

Description of Mine

The Eccles Mines are four in number, No. 1, which is no longer working, No. 3, and two mines, which were the seat of the recent explosion, Nos. 5 and 6. No. 5 is operating in the Beckley seam, the landing being 523 ft. from the surface in that shaft. The Sewell seam in the same shaft is 254 ft. below the surface. No. 6 is in the Sewell seam which, at that point, is 275 ft. below the ground. The bottom of the Beckley bed at No. 6 is 534 ft. from the surface landing, but only the airway is extended to this lower seam.

The Beckley seam in No. 5 varies from 9 ft. on the south to about 7 ft. 6 in. on the north and west. It will average in that mine about 8 ft. The roof is of sandstone without pot-holes or draw slate. Sometimes it will break after some exposure from weathering, but on the whole it is a reliable roof. The bottom is of shale.



Shaft No. 5, the Intake, with Shaft No. 6, the Return, in the Distance

The Mine Was Kept Moist

It is important perhaps to remember this, for it is evident that aside from the sand scattered by the motors to assist adhesion, there was probably little material of a non-carbonaceous nature to stay the progress of an explosion. The reliance of the management was wholly on the removal of coal dust and its continuous dampening.

In this matter, every precaution was taken. There was a system of piping along all the roadways and connections at every room. Though it was not customary to sprinkle before every shot, the rooms were kept damp by copious spraying with water.

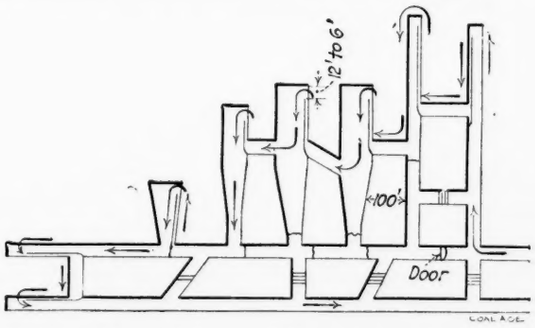
But the management, not satisfied with spraying, turned the exhaust from the fan into the intake and kept

the air damp. The humidity was frequently and carefully measured and averaged 98 per cent. of complete saturation. The roof was at all times dripping with water.

The Ventilating Precautions

The mine made gas freely, but many precautions were taken to prevent a dangerous accumulation. At every place the ventilation was carried within 12 ft. of the working face, not only in entries but in rooms and in crosscuts. When a room was started a fly across the heading baffled the entering air, and a well secured brattice cloth up the roomway conducted the air to the face of the room.

As soon as a room crosscut was driven to the room above, flies were put inby, outby and in the room neck. Thus the air could not enter by the heading, and even



Method of Ventilating by Stoppings, Curtains and Flies

when a fly was lifted in the entry for the passage of a man or a trip, the fly in the room being closed, the air was kept from circulating by any path except that prescribed near the working face. Thus the gas was effectually swept out by the current.

The air was provided by a 22-ft. Jeffrey fan generating about a 1-in. water gage. The two mines were still small and the airways large, so that much air pressure was not needed. I understand that no analyses were made to determine the methane in the return airway, nor were any more refined tests of its gas content made than are afforded by the ordinary safety lamp.

The mine cars are of the end-gate type. They are in excellent condition and reasonably tight for cars so constructed. The end gate is of iron, though the car is of wood. Self-dumping cages are in use.

The Shafts

No. 5 was the intake. The shaft had three compartments, one for air and two for hoisting, the airway being partitioned from the hoistway by tongued and grooved flooring. The same construction detail was followed in shaft No. 6, but the airway alone extended to the level of the Beckley seam and it served as a return instead of an intake.

The top of the airway in No. 5 was covered by steel doors to open should an explosion occur and thus protect the fan. These proved effectual, when the explosions occurred; they did not open, it is true, but were blown bodily from their hinges. However, the fan was amply protected.

The map will show how carefully the mine was laid out and driven. The management of other details was just as thorough. All the room crosscuts were closed by stoppings of wood or of brattice cloth. The heading breakthroughs were closed by walls of masonry 4 to 6 ft. thick, except that in a few cases there were brick walls 16 in. in thickness. The masonry walls were of good construction, being plastered all over their faces with lime mortar.

Shooting Arrangements

The pick miners fired their own shots. They were required to use Monobel No. 2 powder and to tamp with clay, which was supplied them. The company engaged two safety inspectors, but it is too much to assume that these men were able to stop entirely the pernicious habit of shooting from the solid or could assure themselves always that clay and not coal slack was used in tamping.

It is nearly always possible for a man who has fired a shot of greater depth than his undermining to slip up after his shot is fired and cut a small undercut near the floor, which will resemble the extreme end of a *bona-fide* undercut, as it is revealed after the coal is shot down. Of course, these inspectors, if faithful in their work,

No. 5 Mine Car
The end gate was of steel and comparatively tight fitting. The cars were of tight construction.

A Shaft Door
This was blown off when the mine exploded. The round hole shows where a pipe was blown through the door.

must have reduced the amount of such solid shooting, but they could not absolutely prevent it nor always detect it after it had been done. The shotfiring of machine-mined coal was done by the company's shotfirers, the holes being both loaded and fired by them.

The haulage and even the gathering were performed mainly by electric motors, using 500-volt direct current. The transmission was all at that voltage, though 2300-volt alternating current was used for the town transmission, the current being transformed for lighting to 110 volts.

No. 5 mine was producing about 1500 tons per day and No. 6, 500. No. 3 mine, which is in the Beckley seam, is producing about 1200 tons.

The Explosions

The first and most violent explosion occurred at about 2 p.m., Apr. 28. It threw out large portions of the partitions in both shafts with a large quantity of mud. One head cager was blown away from the shaft mouth but was not severely hurt. The upper part of a man was thrown up No. 5 shaft and landed on the surface. A boy who was on one of the railroad cars was blown off and fell, breaking his arm. No other men on the surface were injured.

A pipe was driven up through the doors of the airway in shaft No. 5, making quite a neat perforation. Neither of the wooden headframes was in any way injured, but the stairs, of course, in No. 6 mine were blown out. The approach also by Shaft No. 5 was completely cut off by the wreckage caused.

Twelve minutes later another and less violent explosion occurred, which threw out of the shafts material which

had possibly fallen back after the first explosion. Fortunately this event occurred before any rescue work had been attempted and no further explosions occurring there was no addition to the list of dead from such work.

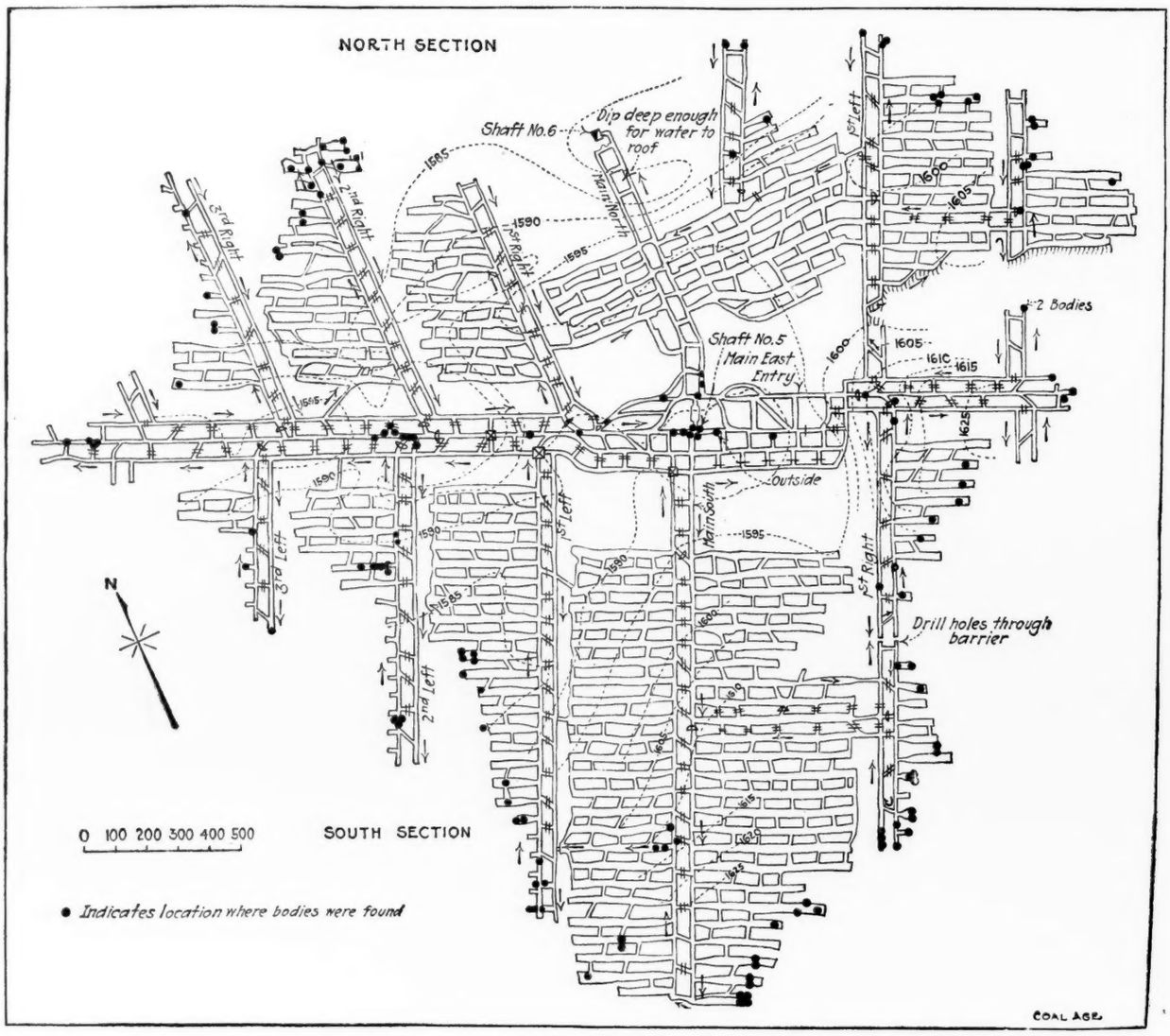
The Fan Is Reversed

The mine officials soon realized that the hope of rescuing any men in No. 5 was wholly in vain, whereas it seemed quite hopeful that the men in No. 6 could largely be saved. After the fan had been stopped and the shaft doors replaced in No. 5 shaft, the fan was reversed so as to prevent driving the air through from No. 5 to No. 6. The result showed that this was wise as all the men but eight were saved in those workings, 67 being rescued.

All the men but thirteen have been found in No. 5; some, it is true, were not immediately killed by the force of the first explosion and some had their faces down in water, which they had sought for self-protection, but none apparently had traveled far and it seems certain that had the direction of the current been maintained, it would only have resulted in the destruction of the men who were saved in No. 6.

Great Care to Ascertain Cause of Explosion

The company has always maintained a careful checking-in system. Every man takes a check off a board on going down and replaces it on his return. The number is also checked by the man in charge of the cage, who counts the number of his passengers on each trip and totals the figures thus obtained. The number loss is, therefore, absolutely certain, though 13 bodies are still buried (May 7) and have not been found.



No. 5 Eccles. Probably the Explosion Occurred in the Locality Represented near the Lower Right Corner of the Map in a High Portion of the Mine

Many of the bodies were not identified because the violence of the explosion stripped them of their clothing and scattered the checks. The engineers of the rescuing force carefully noted where every man was found, how he was lying, his condition, his valuables and all other details. They are especially anxious to ascertain the direction of force. Partly because of there being two explosions and partly because of the complication of the phenomena exhibited in even the most simple of these accidents, there is no sufficient evidence yet (May 7) to show where the accident originated.

Great Violence Exhibited

The violence of the explosion was exhibited almost everywhere. Concrete overcasts with rail reinforcing have been entirely removed and destroyed. The roof has been blown down to a considerable height. This seems to be the cause for the delay in finding the bodies, for it does not seem likely that any of the undiscovered men are far from the places in which they had been working, in fact the mine is too small and new for that to be possible, but nevertheless it is useless to search for them except as a part of the general overhauling the mine will have to receive in being put ready for operation.

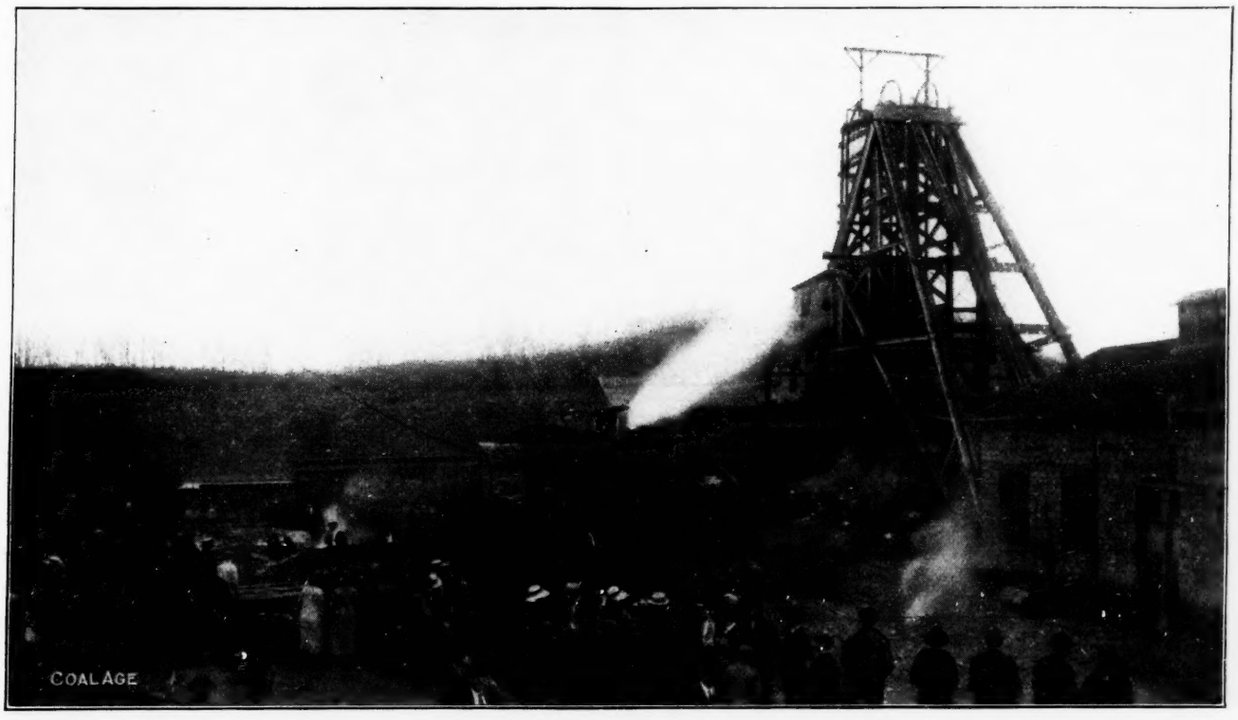
The rescue work was made more difficult by the fact that the pumps were put out of commission by the explosion. When the rescue men reached the foot of No. 5 slope the rails were covered already by 18 in. of water and in one place where the coal dipped between No. 5 and No. 6, the water soon rose so that only the fact that the roof had fallen to a considerable height made it possible to continue recovery work. However, it was soon seen that the clearing of the mine of water by pumps must precede any further work for the recovery of bodies, and proper steps were taken to that end.

The only place where the explosion did not appear to have done much harm was in the Second Left in the South half of the mine, where there were two local dips, in which the water stood about 8 in. deep. This section not only was too wet for the extension of the explosion, but also was possibly protected by the perfect stopping, which the explosion had itself erected by piling a trip of cars near the mouth of the entry.

It will be noted that rooms in the Main South had been driven up and extended to the line of what was known as the First Right in that section of the mine. Headings had been driven back to meet this First Right entry, but were not pushed completely through. The small block of coal remaining had been pierced by drill holes. When the explosion came, these curtains of coal appear to have been blown out.

It may be reasonably objected that there were not enough splits for a gassy mine. One split passed up 2nd, 3rd and 4th Left of the South section, then crossed over and ventilated 4th, 3rd, 2nd and 1st Right in the North section. Another split passed along the nearer half of 1st Right and all the 2nd Right in the South section, and then passed over and ventilated 2nd and 1st Left and another unnamed heading in the North section. In this distance they must have gathered no little gas, even though some of these entries were short, in fact, mere stubs of headings and were producing but little coal.

Fortunately there was at no time any fire in the mine and the rescuers established the ventilation without preliminary skirmishing in helmets for the location of fires. It is only right to note that had a fire started near the shaft, there was no lack of material to feed it.



Shaft No. 5 after the Explosion. The Fan Was Not Injured nor the Surface Works though Much Lumber, Mud and Even a Human Body Were Ejected from the Shaft

The Social Conditions

The mining village of Eccles is one of the newer towns in the West Virginia field and like many of those now building, is far superior to the old. The houses are well built, neatly painted, and the streets are kept clean. Standing on high ground, where the mountains are not forbidding, the general appearance of the camp is strongly in its favor.

The relations between the company and the men are extremely favorable. The town is not far enough from Paint and Cabin Creeks to have failed to feel the disturbing effects of the virtual civil war in that section. Yet only a few days idleness resulted at Eccles. The company has a little emergency hospital, and on the day of the

explosion had just opened a bath-house for its men. There is an air of cleanly hopefulness about the company store and the people, which betokens the excellent character of the management and personnel.

One is, therefore, disposed to feel that at this mine less than at any others should this unfortunate accident have occurred. Neither operators nor miners merited any such unkindly fate and one begins to realize what a problem is to be confronted if accidents are to be ruled out of mines operated by men of less responsibility and filled with men of shiftless, characterless type, such as are often to be found where all the conditions of life are unfavorable.

Safety Provisions

The president, Frank Guiterman, has determined to take three steps to assure greater safety. Shaft No. 3 is already operated as a safety-lamp mine, all the miners and day men being provided with Hirsch electric mine lamps. Miners will no longer be permitted to load or fire their own shots. In that way "solid shots" will be eliminated and the character of the explosive used will be

Eccles, No. 6 Where the Men Escaped

known beyond question as also the nature of the tamping. Moreover, the shooting will be done at night when the mines are nearly empty of men. Lastly, the voltage used in the electrification of the mine will be lowered to 220 volts.

These changes will involve much expense, but there is no question but that they are necessary. The workings will still be electrically operated gaseous mines. While the machines can and may be made explosion-proof, there is still a risk from the locomotives should a door be left open and a heading become charged as a result, with gas in explosive quantity.

An Incident in the Rescue

It is interesting to note that in moving a dead body in a room already so filled with gas that the bearers had to hold their lights low to avoid it, a cadger of carbide rolled out of the dead man's pocket into a pool of water and immediately filled the air with acetylene gas, against which a safety lamp is said not to be a sufficient protection.

Nothing happened, but the rescuers were not satisfied till they were well removed from the place. Provided the cadger head is reasonably water-tight and is closed, no harm could result, but a loose capped cadger under such circumstances might cause a deplorable result. However, cadgers of carbide and a room full of gas rarely occur together. It would not, however, be impossible to start an explosion in that manner, even in a nongaseous mine.

Need for Greater Strictness

It is to be hoped that the chief inspector of mines will err on the side of strictness in classifying mines, so that all which are in the least gassy shall be declared to generate gas in dangerous quantities and shall be required to be operated with the use of safety lamps. There is really no logical reason any more why safety lamps should not be used. They give a better light than ever before, so that the risks from roof falls and other dangers will not be unnecessarily increased by their use. And it is only right to note that not only in West Virginia, but in many other states are excessive risks being taken by the use of open lights in dangerously gaseous mines.

The provision of shotfirers is also to be commended to the chief inspector's attention. So long as shooting is done by all the miners and during working hours, there is great risk of illegitimate charging of holes and solid shooting and an assurance that when an explosion occurs as a result of this cause, nearly every man in the mine will be the victim of that one man's carelessness.

The company readily supplied every detail of information requested and gave every assistance to those who reported the disaster. F. P. Bayles is assistant general manager, M. E. Kent, superintendent of the three Eccles mines and of the Sun colliery, and R. J. Burmeister is chief engineer.

Coroner's Verdict

The verdict of the coroner's jury which was returned Sunday, May 17, after two days of investigation is as follows:

We, the jury, find that John Adams and the 171 other men who were killed in shaft mine No. 5, at Eccles, Raleigh County, W. Va., on Tuesday, Apr. 28, 1914, came to their death by an explosion of gas in the said mine. And we do further find that the eight men who came to their death in shaft mine No. 6 at Eccles, W. Va., on the evening of Tuesday, Apr. 28, 1914, came to their death as a result of an explosion of gas and dust in shaft mine No. 5 at Eccles, W. Va., they having been overcome by afterdamp entering mine No. 6 after the explosion in mine No. 5, the two mines being connected.

The accumulation of gas in mine No. 5, which was the primary cause of the explosion, was due to a short circuit of the air in the southern section of the mine. This gas was ignited by an open lamp and the explosion followed.

We, the jury, furthermore find that this short circuit of air was caused without the knowledge or consent of the company or any of its operating staff, and that the company is in no way to blame for the disaster.

Later Note

S. R. Ritchie, of the company, said that the cause above stated seemed the real origin of the accident. A contractor whose work in two parts of the mine had been rendered difficult by an intervening pillar of coal had blown a hole through it and was found dead not far from the pillar. Probably this pillar was one of the two in the First Right, Southern Section, where headings had been driven both inby and outby to meet.

An air receiver with an accumulation of oily waste is liable to take fire if allowed to get hot. Consequently oil should not be allowed to collect in quantity at the top of the water which is drained from the air. When the water is drawn off, the oil will be deposited on the inner surfaces of the receiver and will be in suitable condition to evaporate and cause an explosion of great violence.

The Colorado Strike

SYNOPSIS—The strikers are not surrendering their guns in sufficient numbers to give assurance of peace should troops be withdrawn. The army forces have done hardly anything to compel disarmament. Several men brought in by the operators since the Ludlow battle to work in the mines have been restrained by United States troops. A court martial is examining Major P. J. Hamrock on charges of arson, murder, manslaughter and larceny. The testimony of the militia in this trial is given in some detail.

The striking mine workers have been somewhat slow to surrender their arms, much to the discomforture of the operators and their employees, who are now disarmed and constantly hear that the U. S. troops will soon be withdrawn.

Confiscation has been long delayed and there has been given an excellent opportunity for the burying of guns. The troops entered the field Apr. 29, and only at 5 o'clock, May 13, did the confiscatory order go into effect. Two whole weeks passed during which the hiding of arms could proceed. It is said the foreigners do not understand American ways and must be handled with gloves. We readily grant them such a lack of understanding and we conceive that they are utterly at a loss to comprehend our dilatoriness in enforcing that most organic law of battle which prescribes disarmament of all persons not forming part of the army of occupation. Surely they draw the conclusion that we fear them and are too weak to attempt confiscation of their arms.

THE STRIKERS ACCUSE OPERATORS OF HIDING ARMS

The strikers have repeatedly declared that the operators are hiding their arms; E. L. Doyle, secretary-treasurer of the United Mine Workers and apparently a man not given to careful statement, is freely circulating such reports. One specific declaration to this effect was made in a local newspaper and the editor was ordered by the military authorities to retract this statement in the pages of his publication.

Colonel Lockett is making careful search for a weapon from the stock of which a rubber fragment was broken during the Forbes fight. On May 15 this gun had not been delivered by the strikers to the military authorities.

The danger to the men working in the mines is considerable in case protection is removed by the United States and it is likely that the nation will have to pay heavy damages to foreign countries should the Greeks and Bulgarians start a marauding expedition on unprotected mine camps. This fact has appealed to Doctor Dumba, the Austro-Hungarian ambassador, so forcefully, that he visited the Secretary of War and urged the retention of the United States troops at the seat of war.

THE U. S. ARMY SHOULD NOT LEAVE

In fact, the sense that the army should not be removed is expressed by nearly all parties and there is everywhere a fear of replacing the Federal forces by the militia. It is true that the militia which numbered, at the best, 1427 men, which was the number on Dec. 8, managed to keep order scarcely less complete than is now maintained by 1700 U. S. soldiers, but this militia was supported by the arms in the hands of the guards employed by the corporations.

But the company men are now disarmed and the feeling is so much more bitter that a larger force is needed, especially as the forces of law and order realizing that the public is backing the disorderly are severely crippled in handling them. To show what a severe task is confronted, we may call attention to the fact that Colonel Lockett requested the governor on May 8 to send militiamen to Glenwood Springs, Oak Creek and Crested Butte in Garfield, Gunnison and Routt Counties, respectively, where conditions were extremely grave. He said that until he had at least 300 more men it would be hazardous to weaken the forces now in charge of the disturbed districts of eastern Colorado.

THE WIDE DISTRIBUTION OF THE DISTURBANCE

The reader should carefully remember how remote these places are. Thus Crested Butte while barely 51 miles from Glenwood Springs is 253 miles by railroad. Oak Creek is only 53 miles from the latter place, but to reach it you must go to Denver, 194 miles, and almost retrace your itinerary for a further 360 miles. With an insurrection of such magnitude it is necessary to be sure that protection is adequate for all the widely separated mining camps.

Those city people who insist on a policeman at every block can hardly understand the needs of a scattered population of peaceful workmen menaced by roving armed forces. There seems to be a degree of question as to the extent to which confiscation is to be carried. Advices state "no search for concealed weapons will be made without further orders from the War Department."

THE COURT MARTIAL

The court martial of Major Patrick J. Hamrock, of the First Regiment of the Colorado National Guard, opened May 13 with Col. W. A. Davis as president and Capt. Edwin A. Smith, acting judge advocate. All the members of the court were present except Capt. Ralph Dorn, who was absent in Routt County on military duty. Maj. H. A. Williams was substituted as a member of the court for Col. George M. Lee. Col. A. C. Sharpe, of the U. S. Army, is attending the sessions as a spectator.

The militia seems ready to assist the court in arriving at the truth. Lieut. K. E. Linderfelt very frankly testified that he had fired into the tents at Ludlow but not until the strikers had opened fire. He said he had prevented his men from shooting when they could have killed 100 men at a volley. He told how Captain Carson had rescued several women and children from the tents.

Lieut. S. J. Lamme, a physician at La Veta, Colo., who acted as aide to Major Hamrock, during the attack of the Ludlow colonists and its repulse, testified that he carried orders from his commander to Captain Edwin S. Carson when that officer arrived with 40 members of Troop A from Trinidad. He stated that he heard Major Hamrock order the machine-gun operators to fire at the pump house and at the rifle pits in the rear of the colony. He did not order them to fire at the tents.

THE LUDLOW CAMPERS FIRED FIRST

Two other officers also in the battle swore that the strikers opened the fight by firing on the militiamen, that the bombs the soldiers fired were used simply as a signal for assistance as the telephone was too slow and uncertain a means of communication. They also declared that Major Hamrock was near the camp when the fire started and that they thought it originated from the upsetting of an oil lamp. In their view the victims died of suffocation, hours before the camp burned.

Lieutenant Benedict of the National Guard declared that the timbers in the shelter pit where the women and children were suffocated or burned were charred to a considerable depth and the wrist and arm of one woman was found removed to a distance from the body. He testified that after he had come up from an arroyo that night he saw men running into the tents and women rushing out crying "Dynamite, dynamite."

Captain Edward F. Carson gave straightforward testimony declaring that the soldiers and civilians looted suits of clothing, miscellaneous garments, umbrellas, jewelry, blankets, grips and satchels full of all kinds of articles. These he said would have been burned had they been allowed to remain. He said it was impossible to obtain discipline, even when he desired to prevent his men from unduly exposing themselves to the fire. Carson further testified that Lieut. Lamme delivered him a message from Major Hamrock ending with the words: "You've got to smoke them out."

Sergeant Patrick Cullom was the man in whose charge were placed Louis Tikas, the leader of the Greek strikers and probably as the Commission states the general of the whole colony, James Tyler and Frank Rebine. He declared that these escaped when the militia suffered a setback due to the firing from the Ludlow settlement. He described their being shot as they crossed the firing line.

It seems that Troop A, which aided in repulsing the attack of the strikers at Ludlow, comprised 130 men of whom all but eight were mine guards and mine clerks. This agrees with the statement of the Military Commission which said that the troop had been so recently recruited that it had not yet selected its officers nor was it supplied with arms or ammunition.

THE UNION FORBIDS MEN TO TESTIFY

So far no testimony has been taken from the inhabitants of the colony. When the Military Commission met, the strike leaders refused to testify because the inquiry was not open. Now they give as a reason for silence that the court-martial

intends to whitewash the militia. John McLennan, district secretary of the United Mine Workers announced that the strikers would not be permitted to testify.

There were some truthful people in Ludlow and apparently the union is afraid of them. J. R. Lawson, who is a member of the National Executive Board of U. M. W. of A. some time ago declared to the press that he did not know positively who fired the first shots. He must have had a somewhat clear idea and did not want to inculpate his followers and so took refuge in a disingenuous ignorance.

He also asserted that Louis Tikas was sent for by Hamrock in order that he might be induced to surrender a non-union man which the strikers had in custody. This was Carindo Tuttoilmando. Now Lawson though he had every reason to deny the presence of this man if he were not there, failed to do so. These facts have given us some confidence in his veracity and probably after some shuffling if he faced the court martial he might tell the truth. The father of the boy Snyder who was shot and several others might likewise be good witnesses. The union leaders have, however, no stomach to meet such an investigation.

UNION LEADERS INDICTED

John R. Lawson, Colorado member of the executive board of the United Mine Workers, Edward L. Doyle, secretary-treasurer of District No. 15, and W. T. Hickey, secretary of the State Federation of Labor and about 150 men were indicted on May 14 by the local grand jury on charges of conspiracy to murder and attempt to murder in the Hecla mine attack.

WILL NOT PERMIT COAL COMPANY TO BRING IN MEN

The United States troops have been removing several men who have been recently brought in by the companies to work in the mines. Their presence has been provocative to the strikers whose wrath the administration is determined to appease by every possible concession. Twenty-five mine workers who had been brought in by the operators to work in the Oakdale mine of the Oakdale Coal Co., and five men who were going to Primero were stopped by the troops on May 14. On the day before six men employed to work at the Royal mine of the National Fuel Co. were prevented from going to work. From a letter received from an official of one of the coal companies it appears that there will be no objection to individuals entering the state or passing from one part of the state to another to accept work from the coal companies. Only the deliberate importing of men is prohibited.

THE MILLION-DOLLAR BOND

The legislature of Colorado has been divided on the bond issue of $1,000,000 for the payment of the state troops. The Ardourel faction among the Democrats in the House desired to put the burden of the taxation on the well-to-do people in proportion to their wealth and especially on the coal operators who hired the men causing the disturbance. There is said to have been a gentlemen's agreement with the Slattery-Fincher faction to introduce the bond bill with another which would provide for an income tax.

The lack of parliamentary knowledge of the Ardourel faction, who mistook the second reading for the first, at which only the title is read, caused them to permit the bond bill to go to a second reading. The income-tax bill was not passed. The bond measure provides for certificates to run 20 years and to draw 4 per cent. interest, with a sinking fund after 14 years to take up the bonds at maturity.

The whole financing is clearly contrary to public policy. Riot bonds should not be of so long a duration. Of the million dollars, $691,000 are already owing; the state has more serious expenditures to face than before and only $309,000 with which to meet them. The contributions of the Union may be expected to keep up the agitation for a long time as the fund for the strikers is more popular than ever.

STRIKING MINERS AT HEADQUARTERS OF U. M. W. OF A., IN TRINIDAD, COLO.

Editorials

The Pioneer Sentiment

The pleasures of "roughing it," of returning to the elemental, of getting back to nature, appeal to us all. And roughness, the elements and nature generally produce in every man a degree of virility not to be despised.

Is it not true, however, that those who thus face nature find themselves scarred by the crudity of it all and become fiercer in their hates, less restrained in their ambition and less fettered by their environment.

The pioneer, strong and forceful, has always been a leader in violence. The history of our own West exhibits this fact. The story of the world in general affords plenty of illustrations as to the truth of this dictum.

It is the establishment of civilization, with its comforts and its restraints, which prevents violence and lowers the force of passion.

All this seems a far cry from coal mining. But if the personal element, as a mine superintendent declared recently, is the most important study in coal mining, surely we have a right to refer to the effect a change in material conditions will have on success in operation.

We believe that the operators must endeavor to improve their villages, to remove the rough-and-ready pioneer feeling, with its picturesque indifference to discomfort and its disposition to make each man an independent unit, utterly irresponsive to popular sentiment. Every effort must be made to bring the outstanding characters under the influence of family ties, human association, education and religion. Every endeavor should be made to hire, not mere bone and brawn, but character.

When Should Rescue Work Be Abandoned?

Prof. Redmayne's remarks concerning the unnecessary sacrifice of life in connection with rescue work following a mine explosion, when workers place themselves in great danger in their endeavor to save entombed miners, have met with considerable criticism. It is recalled that in many instances men have been given up for lost, and yet have been ultimately rescued. The circumstances attending the Courrieres disaster in France have not been forgotten, and an instance of another form of disaster, namely the flooding of the Caradog Vale colliery in Great Britain, has been advanced to show that it is not always the highest wisdom to "dogmatize upon theory." In this latter case, even the local mine inspector intimated definitely that all hope of rescuing the few men who were still in the mine had been abandoned.

No one questions the ability or competence of the average mine examiner, but in this case, the inspector's assumption was completely falsified by subsequent events. Curiously enough, one of the entombed men was able to walk out of the mine before it was discovered that any were alive. What, it is asked, would have been the situation if the mine had been closed down? It may easily be conceived, in the event of a disaster, that one of two extremes may readily be taken.

On the one hand, hope may be abandoned at too early a stage, and men be lost who had merely entrenched themselves in some position of temporary security. The other extremity was demonstrated at Cadeby in England, and at many other mines, where the number of rescuers whose lives were sacrificed was in excess of the number of entombed workers.

The problem bristles with difficulties, and each individual holocaust must be accepted generally as its own guide. The circumstances in one case may vary from those in a second instance. There can be no really "safe rule" for guidance in these matters, and when a mistake or error of judgment occurs in any particular accident, the colliery community very likely will be unwilling to accept the excuse that action based on precedent was strictly followed.

It is well to remember that at the Cadeby colliery in England, three mine inspectors were involved in such an error of judgment, and where authorities of such high standing are liable to be deceived—either one way or the other—the ordinary miner may be pardoned for resenting any interference should he still perceive the least ray of hope in continuing his work of rescue. When the folly of proceeding further is clearly evidenced, then, of course, there is sufficient justification for making a determined stand against further possible sacrifice. Until then everything that is possible should be done.

In connection with the discussion of this serious problem, there is one important reflection: It would be unfortunate to induce a state of mind, or point of view, making it possible for the acknowledged bravery of the mining community to go out of fashion. Science may achieve a great deal, but, balanced by sound practical common sense brave men should still perform brave deeds.

Why Some Operators Fail

Operators too often begin their reforms at the wrong end. They select their material without judgment, and grumble and declaim when it does not reach up to their expectations.

The woman who marries a man to reform him is like the operator who hires a miner whom he knows has been in debt needlessly for the last ten or fifteen years. Such a workman is utterly beyond reform.

Every man around a mine should, if possible, be an efficient worker and a money saver. It is hard to thrust out the inefficient with the union to oppose such action; but it is not hard, we believe, to keep him from coming in. Give good living conditions and get a reputation for fair treatment: this will attract good men.

But do not go out and bring in men of unknown character and agree to advance them transportation, tools and a week's living. If the men have not enough money to come to your camp, they are liberal spenders and perhaps drunkards. They are probably inefficient men and not at all to be desired.

Above all, do not do your colonizing by sending out

padrones who will lie to and mislead the men whom they secure. Such exploiters of both capital and labor regard all two-legged creatures as men. No one is so out-at-heels, so lazy, shiftless, drunken, but that he will satisfy them.

And, lastly, do not regard drunkenness as a light offense, or put a saloon in your mining town. Men who drink should be weeded out and no attempt should be made to accommodate them. The sentiment of the public supports the operator in this move and will be with him when he removes the wife beater and the man who neglects his children.

Character must be the watchword. The tonnage may be raised temporarily by disregarding it, but trouble ultimately results. Many a mine runs along with poor human equipment, and when ultimately there is a general smash-up, there is no reason for surprise. If operators selected their machines as they do their men, they could expect no other result than disaster.

A Trust in Virtue

It has been said that industrial corporations have brought criticism on themselves by allowing some of their competitors to engage in questionable practices. It is certain that the public is convinced that there is a trust in morals even more truly than there is in prices. The man on the street regards the morals of one corporation as a fair basis for the indictment of them all.

It is necessary, therefore, that there should be a strong attempt among all right-thinking, right-acting corporations to bring pressure to bear on all those who use their men wrongfully and which do not seek safety in operation. As a body the industry should endeavor to clear away dishonesty and carelessness from its mining operations. In no better way can harmful legislation arising from the indignation of an aroused public be avoided.

Moreover, only by compelling every one in the business to deal with fairness, can upright men continue in a business where competition is as fierce as in coal mining.

In no matter should there be more stringent endeavor than in arranging for fair weight. It is true that coal sometimes loses in weight from drying and again by theft on the railroad, but these losses should be sustained by the operator, not the miner. The miner is surely contributing all that can be demanded of him when he loses what dribbles off the mine cars. Only when there is a violent wreck does the miner get compensation for such losses. The loss of coal at many mines during the careless transportation to the surface is much larger than the corporation suffers during the trip to the scales. Consequently, we think it an extremely questionable practice to try and make the weigh scales of the tipple check the scales of the railroad company by manipulation of the former.

Especially is it wrong to make the whole tonnage sold balance the tonnage for which the miner is paid, overlooking all the tonnage used in power output at the mine. Moreover, it is unfair to take the weight of empty cars in the winter, when they are well sodden, to compute the net weight of the loads, and make no change in the summer when the majority of the cars are dried out.

It is essential to do everything to prevent all such irregularites, even if we have to introduce scales to weigh each empty car on its return from the dump. There are devices now by which such a weighing can be made automatic and which need no watching. By averaging weights of empties one day, the fair tare could be found for the next.

Most of the coal companies are above little tricks in their weighing. Those that are striving to balance evenly their debits to the miners with the credits from the railroads are giving reasonably accurate weight and are satisfying themselves with the thought that the contrivance used is largely to avoid paying for water which the miner did not dig, dirt which he should not have loaded, coal which the children should not have stolen or which the railroad should not have bumped off the car. But some companies seek even a balance in their favor and in any event a scale committee formed of miners' and operators' representatives traveling from mine to mine with an adequate equipment for testing scales would give the men an assurance they would not otherwise have.

There are several ways in which a union of operators, a trust of virtue, could be formed, which would make everyone, operator, miner and public better satisfied. The agreement of the operators is made as a result of their combined effort, but never do these same coal-mine owners join hand in hand to force all the members of their organization to keep the agreement to the letter.

We would suggest that all those operators who believe in safety in their mines to such a degree that they want strict laws to make those safety provisions binding on all, join the American Mine Safety Association and make it a live body and equal to the work it proposes to do.

We would urge that all the associations of operators use their coercion not only on their employees, but on themselves to the end that the agreements made shall be kept to the letter and to so modify those agreements that unsanitary and unsafe conditions in camps and mines may not be possible.

The coal industry is a public necessity Nobody can escape paying for coal or taxes. The mind of the man on the street is obsessed against the coal operator and the tax collector. He cannot escape the coal operator's charges any more than he can transportation dues, and so he rebels against the coal operators as he does against the railroad. Only by conducting the coal business on a higher moral plane than the traffic of the rest of the world can the operator hope to free himself from censure.

The World's Coal

The world's output of coal at the present time is approximately 1,300,000,000 metric tons annually. Of this enormous total the greater part, or about 75 per cent., comes from the United States, Great Britain and Germany. The value of the world's output of coal is about $2,300,000,000. More than 3,000,000 men are now engaged in this great industry.

It is interesting to note that in the United States where we produce more than half a billion tons each year, only 800,000 men are employed, while in Great Britain, where the production is considerably less than 300,000,000 tons annually, more than 1,100,000 men are employed. Even in Germany, where efficiency is supposed to be high, 700,000 men are employed to produce 240,000,000 tons.

It is possible, however, that our high mechanical efficiency, and consequent rush, is partly responsible for the high death rate in American mines.

Sociological Department

The Membership of the American Mine Safety Association

It may not be generally known that the American Mine Safety Association has memberships of various kinds. There are "active members," who are permitted to join because their occupation, affiliation or interest qualifies them to consider the issues and forward the aims for which the association is organized. Of these there were 127 at the last enumeration. The annual dues are $3.

The Incorporated Members

Then there are associate members, which are not persons of flesh and blood, but national institutes, societies and associations, national and state departments and bureaus; and firms and corporations concerned in the mining industry or whose principal object is the reduction of the loss of life and property in mines. The annual dues are $10, except to the Federal Bureau of Mines, which is prohibited by a statute from payment of membership fees or dues in societies or associations. These associate members are entitled to representation by three persons, each of whom is entitled to all the privileges of active members. Of these there were 29 mentioned in the last report. Three manufacturing corporations only have so far entered under this head, the Sullivan Machinery Co., the Mannesmann Light Co. and the E. I. Dupont de Nemours Powder Co. More of such concerns should become members.

There are two mining associations, only one of which is a coal-mining body, the Rocky Mountain Coal Mining Institute, and the Gogebic Range Mining Association. All the other institutes should incorporate in this society. The list of mining companies is larger and includes nearly all the largest concerns, especially those in the anthracite region. There are also several of the smaller corporations. When a company itself is interested it has some right to appeal to its men to belong.

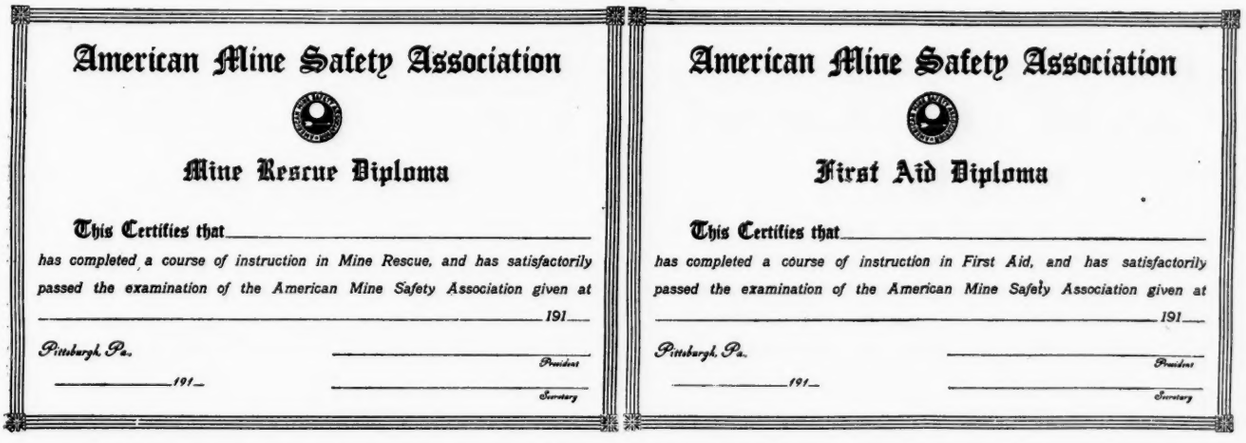
The National Service Corps

The National Service Corps contains 226 members, who pay 50c. dues per annum. Only those can belong who are actively connected with mining or metallurgy and have received sufficient instruction and training or have had such experience as may enable them to act as a member of either a mine-rescue or a first-aid team.

Only those can belong as mine rescuers who hold a certificate of proficiency from the U. S. Bureau of Mines from any of its coöperative stations or from the state mine-rescue departments. But the association retains the power to recognize the certificates of other bodies.

To join the Service Corps as a first-aid man, the applicant must be certified as proficient by the U. S. Bureau of Mines, any of its coöperative stations, the state mine-rescue departments, the American Red Cross, the Army, Navy or similar Hospital Corps or the St. John's Ambulance Corps, or their equivalents, as may be duly authorized by the association.

Instead of such certificates of training, applicants may be admitted upon presentation of sufficient evidence of having been engaged in such organized and scientifically conducted rescue or first-aid work as to warrant their approval by members of the committee: To have won a place in mine-rescue or first-aid contests, field meets, demonstrations or maneuvers and training work in preparation for the same may be accepted as evidence of eligibility for service membership.


American Mine Safety Association

Mine Rescue Diploma

This Certifies that _____

has completed a course of instruction in Mine Rescue, and has satisfactorily passed the examination of the American Mine Safety Association given at _____ 191__

Pittsburgh, Pa. _____ President

_____ 191_ _____ Secretary

American Mine Safety Association

First Aid Diploma

This Certifies that _____

has completed a course of instruction in First Aid, and has satisfactorily passed the examination of the American Mine Safety Association given at _____ 191__

Pittsburgh, Pa. _____ President

_____ 191_ _____ Secretary

Mine-Rescue and First-Aid Diplomas Issued by the American Mine Safety Association

The Button Is a Badge of Honor

Thus those who are service members may wear their buttons with a great degree of pride. The regular or active members and the associates do not partake of that distinction, the badge they wear showing their interest and desire to assist and not their ability to perform such acts of mercy. There is no little merit in deserving the button of the service member, for it shows training and education and not merely the contribution of money to the cause.

Of course, the applicant for service membership must fill out an application form, showing his training, experience and practical work in mine rescue, first-aid, or both. This will be checked by the secretary from such records as are available and if it cannot be thus checked it will be forwarded to that member of the service membership who lives nearest the applicant, for his approval or rejection.

Title to Membership Must Be Maintained

Each service corps member will receive a diploma like those shown and will also receive a button like that illus-

Buttons Worn by Service Members

trated above. Each member has to submit a statement each year certified by his mine manager, physician or safety engineer or by an active or associate member of the association, showing he has taken supplemental training during the year.

Any man, therefore, who is duly a member of the service corps, not only has been a first-aid or mine-rescue man, but has, moreover, kept up his training and is fit for service.

We believe there will be several who will qualify this year and will wear this badge of honor. Every first-aid and mine-rescue corps should make it a point to induce its members to join the association.

Meeting of the Kentucky Mining Institute

SYNOPSIS—A well attended institute with a successful first-aid meet. Some observations and criticisms of the work performed by the teams in the latter.

The Kentucky Mining Institute held its summer meeting, May 8 and 9, in Lexington, Ky. The sessions were well attended, and it is evident that its future will be most successful though its earlier history was not so assuring. The session of the first day was held in the Mining Engineering Building of the Kentucky State University. Unfortunately the president, W. L. Moss, was not able to be present on that day, and R. D. Rash, his immediate predecessor in the chair, presided in his stead.

Major R. U. Patterson, Medical Corps, U. S. Army, who is in charge of the First-Aid Department of the American Red Cross, made an address. A buffet lunch was then served in the Buell Armory by the department of domestic science of the University. In the afternoon, C. W. Strickland, mining engineer for the West Kentucky Coal Co., Sturgis, Ky., read an article on "Some Other Difficulties"; E. Drennen, manager of the Elkhorn Division of the Consolidation Coal Co., Jenkins, Ky., a paper on "Mine Motors"; I. P. Tashof, of the State University of Kentucky, an account of "Mine Safety in the Lake Superior Copper District." "The Workmen's Compensation Law" was discussed by W. H. Cunningham, secretary of the Kentucky Mine Owners' Association, Ashland, Ky., and "The New Mining Law," by C. J. Norwood, chief inspector of mines, Lexington, Ky.

The Banquet

At 8:45 p.m., a banquet was held in the dining hall of the Phoenix Hotel. Johnson N. Camden acted as toastmaster, and the grace was delivered by Bishop Burton. John G. Cramer, secretary of the Lexington Commercial Club, delivered an address on "Lexington as a Mining Town." Henry S. Barker, president of the State University, then spoke on the "State University and its Relation to the Mining Industry of Kentucky."

Major R. U. Patterson's remarks related to the present condition of Mexico and the preparation of the Red Cross to meet the situation should further unfortunate developments occur. W. L. Moss, being still absent, F. D. Rash spoke on various topics and Van H. Manning followed with an address on "The National Bureau of Mines." As the hour was late the impromptu remarks scheduled on the program were omitted.

Mining Pictures and Business Session

On the following day exhibits of "Safe Methods of Mining Bituminous Coal at the Mines of the United States Coal & Coke Co., Gary, W. Va., and of "An American in the Making" were made at a local moving-picture theater. A short business session was then held in the ballroom of the hotel.

The discussion of funds which is perennial at most of such institutes took up much time. Like all organizations to which the subscription rate is only $2, there is a shortage in the treasury. Part of this is due to the cost of moving the experimental gallery to Lexington for the meet and part is accountable to expenditures for printing and postage. The operators of western Kentucky contributed liberally toward the expenses of moving the gallery and the eastern Kentucky operators will doubtless do equally well when so requested, so the only deficit remaining will be that for regular expenditures and, as a result of a vote, an assessment of $1 will be levied on members to wipe out this item.

The New Officers

The following were elected officers of the institute: President, H. La Viers, Paintsville, Ky.; secretary-treasurer, I. P. Tashof, State University, Lexington, Ky.; vice-presidents: W. C. Tucker, Benham, Ky.; L. B. Abbott, Jenkins, Ky.; W. S. Wells, Prestonburg, Ky.; J. E. Butler, Stearns, Ky.; B. R. Hutcheraft, Lexington, Ky.; C. W. Taylor, Greenville, Ky.; and T. E. Jenkins, Sturgis, Ky.

In the afternoon the first-aid men and the band met at the Chesapeake & Ohio Ry. station and marched to the athletic field of the University. The students were holding a track meet and the spectators divided their attention between the first-aid events, the track exploits and the explosion gallery.

The contesting teams were as follows:

1. Continental Coal Corporation, team No. 1. 2. Stearns Coal Co., Barthell team. 3. Consolidation Coal Co., Van Lear team. 4. St. Bernard Mning Co., team No. 1. 5. Continental Coal Corporation, team No. 2. 6. W. G. Duncan Coal Co.,

Graham team. 7. Stearns Coal Co., Stearns team. 8. Consolidation Coal Co., Jenkins team No. 1. 9. Continental Coal Corporation, Barker team. 10. Wisconsin Steel Co., Benham team. 11. W. G. Duncan Coal Co., Skibo team, Greenville, Ky. 12. North East Coal Co., Auxier team. 13. W. G. Duncan Coal Co., Luzerne team. 14. Stearns Coal Co., Worley team. 15. Consolidation Coal Co., Jenkins team No. 2. 16. Continental Coal Corporation, team No. 4. 17. Stearns Coal Co., Yamacraw team.

Unconscious But Not Asphyxiated

The first event was for one man only:

Man is found unconscious, having sustained a lacerated wound on the left side of the head (temple) and a like wound about 2x1 in. in diameter on the point of the left shoulder. Treat the case and carry 25 ft.

First-Aid Squads Competing at Institute Meet

Banquet of the Kentucky Mining Institute, Lexington, Kentucky

In the view of the judges, resuscitation was unnecessary in this case. Of course, if the unconsciousness had been the result of electric shock or asphyxiation from bad air, in fact, had he not been breathing, then the pulmotor, the Shaeffer method or some other device, might have been used with advantage. But it is to be noted, the statement is merely that he is *unconscious,* and there seems reason enough for that condition in the lacerated wounds of the temple and shoulder. It is essential that the man receive treatment for both these injuries immediately and not for a condition which the first-aid men have little or no reason to believe exists.

It is waste of time to treat for injuries not received, especially those demanding when indicated such extended treatment as resuscitation. If the man is actually breathing, the unnecessary work of stimulating the lungs would take place while he was rapidly losing blood and strength. It would make the condition of the patient worse rather than better.

Some favored the Sylvester method because that system had been taught them. It did not occur to them that a lacerated wound on the point of the shoulder would be made far more dangerous if the pump-handle motion of the Sylvester method were used on the patient. First-aid men must think. The problems, doctors have taught, will not necessarily be the conditions underground, and if a first-aid man cannot distinguish between the spirit of the instruction and the letter of it, he is a mere automaton and unworthy of a medal.

Where to Arrest Bleeding

The second was a full-team event:

After falling off a car a man is found to have the following injuries: A compound fracture of the lower jaw on the right side with slight bleeding, a deep lacerated wound on the inner side of the left ankle with profuse bright red bleeding. Treat and carry 50 ft. on a stretcher.

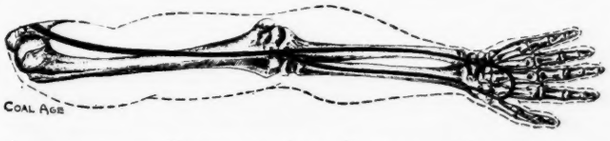
Last year both at the Knoxville, Tenn., meet and at that at Pittsburgh, Penn., several men made the mistake of putting the tourniquet too far from the injury when there was profuse bleeding. Let the first-aid man remember that the tourniquet is not a harmless instrument. It has a long record of deaths as well as of life savings. It might be well to quote from the new American Red Cross book:

"In consequence of cutting off the circulation" by the tourniquet "mortification and death of the part may follow. Therefore, tourniquets should never be used except when necessary and they should be removed as soon as possible." In this case, several men put the tourniquet on the artery of the thigh. The circulation was thus destroyed throughout the limb. There was no need whatever to press the artery so far away from the injury.

Event No. 3 was for two men:

Coal has fallen on a miner. When reached he is found to be unconscious and has received the following visible injuries: Left ear torn off and the ends of the fingers of right hand crushed off, all wounds bleeding profusely. Treat and carry 50 ft. without a stretcher.

In this event also some first-aid men put the tourniquet on the upper arm instead of near the injury. The artery of the arm is divided at the wrist, as shown in the illustration, but by using two pads, this difficulty can be



Arteries and Bones in Arm Showing Where Blood Flow Can Be Stopped

Wherever there is an exposed artery and a bone against which it can be thrust there will be found a place where bleeding can be arrested.

met. "For arresting bleeding of the hand alone," says the Red Cross Textbook, "pressure on the pulse at the outer side of the wrist and at the same place on the inner side will stop bleeding." Both parts of the artery must be controlled as they form a loop from which other arteries to the fingers branch.

No Bleeding and Therefore No Tourniquet

Event No. 4 was for the full teams:

A miner fell out of a cage a distance of about 15 ft., just as the cage started up the shaft. He is found to be unconscious and to have the following injuries: Compound fracture of the left leg below the knee with bone sticking out on inside of the leg. Practically no hemorrhage. Treat and carry on an improvised stretcher.

The first-aid men should have read the remarks quoted before on the dangers of the tourniquet. They certainly would not have then, with unanimity, clapped it on the

patient's leg before he started to bleed. Perhaps his leg artery may have received some injury and shock has caused a temporary cessation of the blood flow. Well and good. The right practice would be to put the tourniquet in place untightened, so that it could be tightened up should the blood flow become dangerous. But with a hemorrhage, such as described, the probabilities are that nothing worse than capillary bleeding is to be anticipated and the tourniquet is really not likely to be needed. However, the first-aid men put it on, subjecting the patient to both unnecessary pain and needless danger.

Do Not Smother a Patient after Reviving Him

Event No. 5 was also a full-team event:

A miner is found unconscious due to afterdamp and has received burns of the hands, forearms, neck and face. Treat and carry 50 ft. on a stretcher made of coats and poles.

Here the most marked error made was to put the gauze on the patient before making holes for his nose and mouth. The man has become unconscious from afterdamp; his breathing is doubtless labored and it is most important to delay long enough to provide for his untrameled respiration.

The Penalties and Awards

The penalties and discounts used by the American Mine Safety Association were adopted. The judges were all medical men; in fact, the Red Cross will not permit laymen to act as judges in events in which it participates. The principal awards were as follows:

Sanchez Challege Cup. Donated by M. Sanchez, of Lexington, Ky., to W. G. Duncan Coal Co., Graham, Tenn. (Cup must be won twice in succession before it becomes the property of any team; meantime, it is to be competed for annually.)

State University Trophy Cup. Donated by the State University and presented by Henry S. Barker, the president of the university, to the Continental Coal Corporation team No. 1.

Lungmotor, donated by the Life Savings Devices Co. Won by the W. G. Duncan Coal Co., Luzerne team.

Sixty dollars in gold, donated by the Jeffrey Manufacturing Co. and an Anemometer donated by the Davis Instrument & Manufacturing Co. This was presented for division between the Stearns Coal Co. Barthell team and the Wisconsin Steel Co. Benham team.

Six vest-pocket compasses, donated by the Fairmont Machinery Co. Won by W. G. Duncan, Skibo team, Greenville, Ky.

Fifteen dollars in gold, donated by Ohio Brass Co. Won by the Continental Coal Corporation, Barker team.

Twelve dollars cash, donated by Bryan-Hunt Co., of Lexington, Ky. Won by the Consolidation Coal Co. Jenkins team No. 1.

The Benham team of the Wisconsin Steel Co. getting a larger score than the Barker team of the Continental Coal Corporation received the 1913 first prize for which the two teams had previously tied. This was a large silver cup presented by the Goodman Manufacturing Co.

There were several other smaller prizes. Medals were awarded to the members of the team receiving the highest average, by the American Red Cross and the American Mine Safety Association.

During the afternoon the large explosion gallery was fired, twice, once with a permissible explosive with a deflective force equal to a half pound of 40-per cent. glycerin dynamite, tamped by one pound of clay and once with black blasting powder of equal deflective force tamped by two pounds of dry clay. In each case, plenty of bituminous coal dust was present, and as might be anticipated, there was no explosion in the first instance and a most severe one in the second.

Free Course of Instruction for West Virginia Miners

In order to further the work of the operators in improving mining methods and conditions in West Virginia, and to assist the State Mining Department in an educational and safety campaign, the Board of Regents of the State University has appointed an additional member of the faculty, whose business it will be to organize training schools for the miners throughout the state. This new faculty member is Robert S. Gatherum, who has been designated as Assistant Professor in Mining, and his appointment will become effective July 1.

Mr. Gatherum's duties will keep him constantly in the mining fields, and as the classes in mining instruction are organized, the work will be put in charge of some well qualified local man. The courses of instruction will be such as are recommended by the Department of Mining at the University, and will be selected according to the conditions in each locality. Lantern slides and motion pictures will show how mining camps may be made both sanitary and attractive; how accidents occur and how they may be avoided; the safe method of undercutting coal by pick and machine; how roofs should be examined and posts set; the proper handling and storage of explosives, etc. These pictures have been made to develop the "safety-first" idea, and will be readily understood by the foreigners who are unable to speak English.

Equipment will also be carried to demonstrate the characteristics and behavior of the various mine gases, and a few simple experiments with each gas will impress upon the miners their properties and dangers. A number of instructive experiments will also be performed upon coal dust, for the purpose of emphasizing its danger. The lectures will include such subjects as sanitation, first-aid-to-the-injured, the raising of garden produce, etc.

Mr. Gatherum is a practical mining man, and is especially well fitted for the duties of his position. He made his start as a trapper boy in the mines of West Virginia at the age of 14, and after wielding the pick for a number of years, he accumulated sufficient funds to secure an education as mining engineer at the West Virginia University, and has since been located in the New River and Kanawha fields.

This further indication of the University's desire to extend its usefulness and carry its instruction to the miners will be generally commended. That such movements tend to decrease the death and accident rates can be proved from the results that have attended similar efforts elsewhere. The Kanawha and New River fields have been chosen to inaugurate the movement, which will be extended to other fields as soon as possible.

Coming Meetings

The summer meeting of the **West Virginia Coal Mining Institute** will be held in Cumberland, Md., June 2, 3 and 4.

The annual meeting of the **Mine Inspectors' Institute of the U. S. A.** will be held in Pittsburgh, Penn., June 9, 10, 11 and 12, with headquarters at the Seventh Avenue Hotel.

The annual meeting of the **International Railway Fuel Association** will be held in Chicago, Ill., June 18, 19, 20 and 21, with headquarters at the Hotel La Salle, La Salle and Madison Sts.

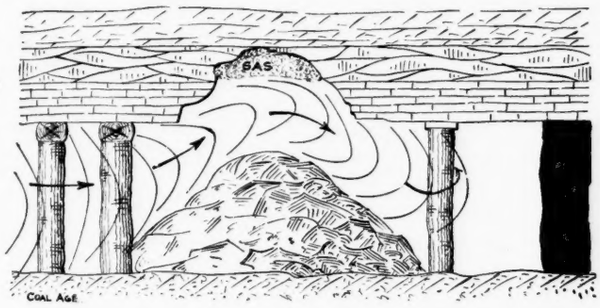
Discussion By Readers

Explaining an Extraordinary Experience

The extraordinary experience described by John Lawlor, Jr., COAL AGE, Apr. 25, p. 682, while unique, will not, I believe, be regarded as wholly phenomenal, when the attendant circumstances are taken into consideration. In my opinion, the peculiar action of the flame of the open light, the flame cap and the inflammation of the mixture with its billowy or undulatory movement can be explained in accordance with the operation of natural laws under unusual conditions and experimented with in an unusual manner.

According to the description given, the roof fell to a height of about 3½ ft. above the line of stratification of the drawslate. By the building of a brattice extending toward the face, from the last cut-through, the sectional area of the air passage was considerably reduced and, as a result, the air traveled with a much higher velocity. When this current reached the cavity left by the fall, it would naturally expand some, but its course would be deflected upward above the fall.

Referring to the accompanying figure, I have indicated by the light curved lines the comparative velocity



ILLUSTRATING ACTION OF AIR CURRENT ON ACCUMULATIONS OF GAS

of the air waves passing over the fall. At the top of the fall and above the passing air current, I have indicated by dotted lines the gas which is issuing from the crevices of the strata and is in different stages of dilution by the air current. Under these conditions, while the air passing over the fall might be practically free from gas to any extent that could be detected by the lamp, the gas close to the roof would be almost pure (unmixed with air). Between the passing air and the accumulating gas, there would be a more or less undefined line where the mixture of gas and air would be inflammable and above this line a light would be extinguished by the sharp gas near the roof. A lamp raised into this mixture would, therefore, first show a cap; but, later, the lamp would be extinguished by the sharp gas.

Referring to the flame cap leaving the lamp, and floating upward with a gyratory movement, it is possible to imagine that in this contracted area and limited space, with a free flow of gas above and a pure air current flowing below, the peculiar phenomenon was presented of a sharp transition from an inflammable to an extinctive atmosphere. Again, by any sudden deflection of the air into the cavity, it may be supposed that, with the rapid diffusion of the gas assisted thus by the velocity of the air current, an inflammable portion of this accumulation was swept from the main body and carried forward as described.

The wave-like appearance of the burning mixture is sufficiently common to need no explanation. It is a well known fact that gas often travels a considerable distance in stratified layers, in a strong current of air. In my own experience, I have often been forced to the conclusion that a higher percentage of gas is found in the air close to the roof and extending partly down the sides or ribs of the entry. This condition, I believe to be due to the air current being retarded more at these points of contact with the roof and sides of the entry, whereby the air supply is less in proportion to the quantity of gas present at those points. The impression that there was "gas all around;" as Mr. Lawlor expresses it, is most assuredly correct; but it was this fact that made the experiment he conducted more dangerous. Again, since the gas acted in the usual manner when the air current was cut off, it is reasonable to suppose that there was nothing in the composition of the gas that would give rise to the peculiar manifestations described.

I. C. PARFITT.

Jerome, Penn.

Safety or Refuge Chambers in Mines

Letter No. 4—I am an ardent believer in the adoption of any means that will tend to the conservation of human life. In respect to the construction of safety chambers in mines, as a means to this end, the question naturally suggests itself: Will such chambers provide the greatest degree of safety, without making suitable auxiliary provisions that will render them available under all conditions. I am inclined to answer this question in the negative. I do not offer this statement as an argument against the installation of such refuge places in mines, or to detract, in any degree, from their utility. I simply want to draw attention to a fact that is already well known, but too apt to be overlooked; namely, that such chambers provided in mines will not be "havens of refuge" under all conditions.

Ignoring, for the present, the number, location and manner of construction of the chambers, and confining this discussion to the question of their accessibility at the moment of need, as a measure of their efficiency, I think that the chances are chiefly against their availability, in most mine disasters. In discussing the question, knowing by experience that an explosion may occur in any portion of the mine, we should consider three cases:

First, assuming the explosion takes place at a point *inby* from the location of the chamber. It is apparent that the pasageways leading to the place of refuge may be rendered impassable, either by the destruction caused by the force of the explosion, or by the presence of afterdamp or fires. In either case, the refuge chamber would be inaccessible to the survivors at the working face.

Second, assuming the explosion occurred at a point *outby* from the location of the chamber, while the passageways leading thereto may not be obstructed as in the previous case, by broken timbers and falls of roof, they may soon be so filled with afterdamp as to be impassable, and access to the refuge chamber again cut off.

Third, if the explosion should occur in the immediate vicinity of the refuge chamber, it is possible that not only the roadways would be rendered impassable, but the chamber itself might be destroyed or the entrance thereto effectively blocked. It is necessary to consider these contingencies as possible, whether there be provided one or more such places of refuge.

Granting the truth of the foregoing remarks, we must conclude that to make the refuge-chamber idea effective, it will be necessary to supply the workmen with appliances that will be a protection and enable them to reach the refuge chamber under conditions that would otherwise make this impossible, owing to the intervening afterdamp. In line with my previous statement, I would suggest the advisability of installing in every working place a breathing apparatus and portable electric lamp that would be available for each man, in time of need. I believe this provision would help to make the refuge chamber available to survivors of an explosion.

While much attention has been given to the work of rescue following an explosion, it seems to me, as has been suggested by John Rose, COAL AGE, Apr. 18, p. 657, that more attention should be given to precautionary and protective measures, both legal and otherwise. The question of expense is a minor factor in comparison with the possibility of saving human lives. There is probably no more hazardous business or occupation than that of coal mining, and few in which there is more recklessness and carelessness displayed on the part of the workers. It will be generally admitted that there are no greater gamblers on human life than miners, and this must be controlled by moral suasion or physical force—law.

I. C. PARFITT.

Jerome, Penn.

The Mine Foreman

Letter No. 5—I have been much interested in what has been written in regard to the responsibilities resting on the mine foreman and his relation to the superintendent. While I think that every man serving in the capacity of superintendent of mines should be capable of passing any examination required of mine foremen, I believe that many foremen who find fault because the superintendent does not accept their suggestions and adopt the methods they propose, are themselves to blame. In many such cases, the incompetency rests with the foreman and not with the superintendent.

It is well known that there are many incompetent mine foremen who hold certificates of competency, but who surely have never passed a rigid examination. Such men lack the necessary ambition to make them successful in the operation of a mine; they are, in fact, only "timekeepers." All men are alike to them; they know little of the work being done, because they do not get around the mine to personally inspect and superintend the work.

Compare such a man with the competent and ambitious mine foreman who realizes that he is more than a mere "timekeeper." This man is known to all his men and he, in turn, knows the character of every man in the mine. He is a good judge of human nature and this fact gives him the ability to handle men successfully. He is always ready to adopt improved means or methods; he consults his assistants and firebosses on every important question. He is devoid of prejudice or biased opinions. Such a mine foreman is not satisfied except when he has everything working in proper order. After starting the men to work in the morning, he proceeds to examine the roadways, travelingways, air courses and working places in the mine. He thus acquaints himself with every condition that exists in the workings. He expects his assistants and firebosses to spare no pains or effort in making the mine safe. He instructs them to report to him at once any place in regard to which there may be a doubt.

It is unnecessary to state that such a man has generally the hearty coöperation of his superintendent; and even when this is lacking, he seldom complains, but strives to produce the best results with the material at his command. His knowledge of mining and thorough acquaintance with the conditions underground enable him to impress his ideas and to offer practical suggestions.

By thus comparing the competent and incompetent mine foremen and the manner in which each performs his work, it is made plainly apparent that it is the negligence, incompetency and lack of ambition on the part of a foreman that is more often the cause of mine accidents, than the incompetency of the superintendent.

B. J. CROOKS, Asst. Foreman,

Midway, Penn. Carnegie Coal Co.

Letter No. 6—The mine foreman is a greater factor and plays a more important part in the coal-mining industry of today than is generally supposed. The plan of development, methods of producing coal and provisions for the safety of the men, in many of the smaller operations, are left wholly to him; and the results obtained are measured by his ability and management.

With respect to the elements necessary to produce results, mine foremen may be classified as competent and incompetent; successful and unsuccessful; ambitious and unambitious; industrious and indolent, etc. The successful mine foreman of today must be both practical and progressive, the methods of operation in the mining of coal are constantly changing. Old and defective systems are being replaced by new and improved means and methods. To such an extent is this true that the successful foreman of a few years ago, following the same methods now as then, would be a failure today.

The mining law of Tennessee, in prescribing the duties of mine foremen, places on them the burden and responsibility of maintaining safe and sanitary conditions in the mine. The position thus involves great responsibilities, and the mine foreman should realize this fact and prepare himself to meet its requirements and demands, as far as possible. Again, the operator places on him the burden and responsibility of putting out the coal at a minimum cost.

With the duties and responsibilities imposed by the mining law on the one hand, and the results demanded by the operator on the other hand, the mine foreman's position is not an easy one, but one requiring careful preparation, thought and the exercise of good judgment. It is apparent at a glance that the duties of the mine foreman are many and arduous. Mine managers and superintendents frequently make the mistake of permitting the mine foreman to be over-taxed. Because he is on a fixed salary and responds willingly to calls at any hour is no excuse why he should be expected to work nights and Sundays, almost without cessation. There is a limit to human strength and endurance, and a nervous strain produced by such over-taxation will often develop a nervous and discouraged worker. Relaxation and rest are even more essential for the mine foreman than for the mine mule, whose working hours are well guarded.

Mine foremen, to a certain extent, become what their superior officials make them, and this effect, in turn, is reflected in the character of men he draws around him. An energetic, active, painstaking foreman develops the same characteristics, in time, among his men. His position is thus a high and responsible one, and the influence he exerts is a potent factor in the success or failure of the operations in his charge. He must be a leader and not a driver of men, faithful in his attention to duties in the mine and persistent in his endeavors to acquire knowledge. Though holding a higher position than the men under him, the successful mine foreman, if not lacking in common sense, will consult with his men and develop among them advisers and efficient assistants in the carrying out of his plans.

A valuable element in the make-up of a mine foreman is honesty of purpose that should be plainly manifest in all his dealings between the company and the men. He can show no favoritism. In his efforts to improve conditions and achieve results, he will doubtless make mistakes, as have all men who have accomplished things worth while.

There is today an increasing demand, in the coal-mining industry, for intelligent mine foremen—men with strong minds and active brains, men who are studying the problems of safety in mining and economy in production with all the zest at their command. Foremen are needed with moral and elevating force of character, who can wield an educating influence over the miners in their charge; inspiring them to better and nobler aims in life, which make for better homes, better citizens and better communities. These are the essential elements of success.

JOHN ROSE.
District Mine Inspector.

Dayton, Tenn.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

SECONDARY SPLITTING

Secondary splitting involves the principles of both tandem and split circulations. The tandem portion consists of the main airway of the primary split and the airways branching from this and forming the secondary split.

It is necessary to first find the general pressure potential for the secondary split section. This is equal to the sum of the pressure potentials of the airways forming that split. This general potential for the secondary split is then combined with the corresponding primary potential, according to the method employed for a tandem circulation, which is thus regarded as one branch of the primary split.

The accompanying diagram shows clearly the method of naming the splits and indicating them by symbols. The

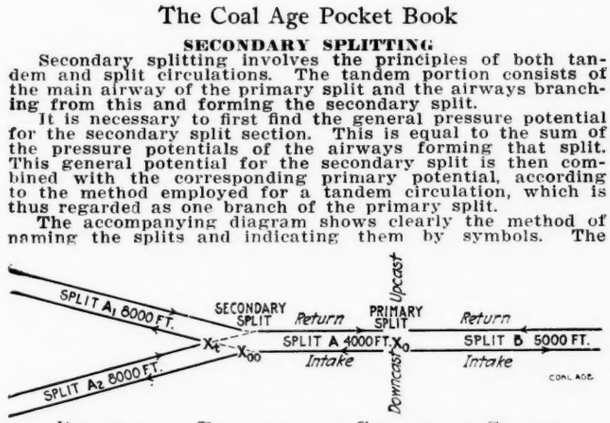


DIAGRAM OF PRIMARY AND SECONDARY SPLITS

primary splits, branching from the point where the air current is first divided, are designated by the letters A, B, C, etc., and the corresponding potentials by X_a, X_b, X_c, etc.

Secondary Splits are designated A_1, A_2, etc., and B_1, B_2, etc., depending on the primary split from which they branch; and the corresponding split potentials by X_{a_1}, X_{a_2}; X_{b_1}, X_{b_2}, etc. The general potential for a primary split is designated X_o, and for a secondary split X_{oo}, or X_{ao}; X_{bo}, etc.

In secondary splitting the operation is much simplified by calculating the general potential for each consecutive point or section, beginning always at the inby end of the system and finding first the general potential for the secondary split; then combining this in tandem with the corresponding primary potential; and using this result to find the general potential for the primary split, in the same manner as for the secondary split. Two formulas only are necessary; the one expressing the summation of the potential values for a split circulation, and the other a similar summation for a tandem circulation. They are as follows:

General split potential, $X_{po} = \Sigma X_p$

General tandem potential, $X_{pt} = \dfrac{1}{\sqrt{\Sigma\,(1/X_p^2)}}$

In all splitting calculations it will generally be found more convenient to use the pressure potential, for the reason that the calculation of the distribution of the air is based on equal pressures, for all splits starting from one point.

The Coal Age Pocket Book

Example—An air current of 120,000 cu.ft. per min. is passing in a mine in two splits, as follows:
Split A, 5x10 ft., 20,000 ft. long; 40,000 cu.ft. per min.
Split B, 5x10 ft., 5,000 ft. long; 80,000 cu.ft. per min.

More air being required, a careful investigation shows that Split A can be again divided at a point 2000 ft. inby from the foot of the downcast shaft, thereby forming two secondary air splits, each 5x10 ft., 8000 ft. long, including the return. This would make Split A 4000 ft. long including the return. With the same power on the air, what quantity of air will be circulated in this mine after dividing Split A?

Solution—The first step is to calculate the potential values of the different sections or splits, both before and after dividing split A to form the two secondary splits A_1 and A_2. This being a comparison of two circulations, it is possible to use the relative potentials, reducing the areas, perimeters and lengths to their lowest relative values, which gives

		(Relative values)
Before dividing Split A:		
Split A,	$a = 50;\ o = 30;\ l = 20{,}000$	$a = 1;\ o = 1;\ l = 20$
Split B,	$a = 50;\ o = 30;\ l = 5{,}000$	$a = 1;\ o = 1;\ l = 5$
After dividing Split A:		
Split A,	$a = 50;\ o = 30;\ l = 4{,}000$	$a = 1;\ o = 1;\ l = 4$
Split B,	$a = 50;\ o = 30;\ l = 5{,}000$	$a = 1;\ o = 1;\ l = 5$
Split A_1,	$a = 50;\ o = 30;\ l = 8{,}000$	$a = 1;\ o = 1;\ l = 8$
Split A_2,	$a = 50;\ o = 30;\ l = 8{,}000$	$a = 1;\ o = 1;\ l = 8$

Relative potentials, before division:

$$X_a = a\sqrt{\frac{a}{lo}} = 1\sqrt{\frac{1}{20\times 1}} = \frac{1}{\sqrt{20}} = 0.2236$$

$$X_b = 1\sqrt{\frac{1}{5\times 1}} = \frac{1}{\sqrt{5}} = 0.4472 \qquad \Sigma X = 0.6708$$

Relative potentials, after division:

$$X_a = a\sqrt{\frac{a}{lo}} = 1\sqrt{\frac{1}{4\times 1}} = \frac{1}{\sqrt{4}} = 0.5000$$

X_b = *Same as before* = 0.4472

$$X_{a_1} = 1\sqrt{\frac{1}{8\times 1}} = \frac{1}{\sqrt{8}} = 0.3535 \qquad X_{ao} = 0.7070$$

X_{a_2} = *do* = 0.3535

Tandem summation (X_a and X_{ao}):

$$X_t = \frac{1}{\sqrt{1/X^2_a + 1/X^2_{oo}}} = \frac{1}{\sqrt{1/0.5^2 + 1/0.707^2}} = 0.4082$$

$$X_o = X_t + X_b = 0.4082 + 0.4472 = 0.8554$$

Since the power is the same, before and after division

$$\frac{Q_1^3}{(\Sigma X)^2} = \frac{Q_2^3}{X^2_o};\ \text{and}\ \frac{120{,}000^3}{0.6708^2} = \frac{Q_2^3}{0.8554^2}$$

$$Q_2 = 120{,}000\sqrt[3]{\left(\frac{0.8554}{0.6708}\right)^2} = 141{,}100\ \textit{cu.ft. per min.}$$

Inquiries of General Interest

Effect of Short-Circuiting Air on Speed of Fan

A mine ventilating fan is discharging a certain quantity of air into a mine when a door is set open between the main-intake and return airways in the mine, thereby short-circuiting the air current at that point. When this occurs, I have noticed that the load on the engine or motor driving the fan is increased. Will you kindly explain the reason for this effect?

INQUIRER.

Stotesbury, W. Va.

The setting open of the door and the consequent short-circuiting of the air current underground, at once cuts out the mine resistance and the pressure on the air in the fan drift drops accordingly. Under this decreased pressure, a much larger quantity of air flows through the fan, which greatly increases the work or power absorbed in the fan itself.

It is this work, which is absorbed or lost in the fan, that affects, in a measure, the torque or turning moment. The work thus absorbed varies directly as the square of the velocity of the air passing through the fan. The ratio of increase in the velocity and quantity of the air current, caused by the short-circuiting of the air, will be determined by the relative mine potentials or the relative resisting capacities of the airways before and after the short-circuit takes place. It should be perfectly evident, therefore, that the load on the engine or motor will be increased as the square of this ratio, and the power as the cube of the same.

A Checking System for Coal Loaded by Miners

I will appreciate an expression of opinion with reference to a problem that is a constant source of trouble to all mine operators and also in respect to a plan I have devised for obviating the difficulty.

I refer to the matter of properly checking the amounts of slate and slack loaded by the miners; and of keeping a check also on those portions of the mine from which the dirtiest coal is loaded. Heretofore, this checking of the miner's output has been attempted by selecting mine cars at random and picking over the whole car, which meant that in all probability, a miner would not have more than two or three of his cars picked a month. The result was a tendency for the miner to take chances and load excessive quantities of rock, and shoot his coal carelessly with a resulting abnormally low percentage of lump to slack. If each mine car could be picked and records kept of the percentage of rock, slack and lump, the problem would be solved at once, but that is impracticable.

According to my scheme, a sample of a predetermined quantity is taken from each car and in such a manner as to prevent the car being loaded so as to affect the fair average character of the sample taken. This sample of, say 100 lb. to the car is delivered to a "sample box," which is marked with the same check number as that of the car from which it is taken. This sample is then treated in any convenient manner to determine the percentages therein of rock, lump and slack. A daily report is kept in which the percentages of rock, lump and slack, as shown by the tests of the samples taken, are tabulated under each check number. We have had this system in effect at Banner Mines for some time, and the results obtained I regard as very satisfactory.

As soon as the men became aware that a large proportion of their cars would be sampled the percentages of rock began to fall off so noticeably that in less than ten days' time the amount of rock loaded, as shown by the amount of refuse hauled away from the picking belt and washer, had decreased very materially. The amount of slate picked by hand at the picking tables was practically reduced one-half.

By arranging a bonus system for rewarding miners whose percentages of rock were below a predetermined average amount, and whose percentages of lump were above a predetermined average amount, it seems quite probable that the men might be stimulated to better mining and loading. The tabulated report of the tests could be kept uptodate and placed where the miners could inspect it. The men that are in the "bonus class" could be designated each day. This tabulated sheet would show the operator at a glance what men are loading the cleanest coal, what men are shooting their coal best and hence have the highest percentage of lump where lump is desired; and, by knowing the location of the working places of the respective miners, it will indicate which parts of the mine, if any, are producing the dirtiest coal.

Such a system would also serve as a warning to men whose percentages are constantly poor, and would enable the operator to eliminate, when opportunity occurs, by a system the fairness of which cannot be questioned, the undesirable ones from among his miners. A vital feature of the system is the maintenance of the check number on the sample corresponding to that of the car, so that the samples can be taken without interrupting the usual rapid dumping of the mine cars. The samples can be tested at leisure, and the results tabulated.

A discussion of this system with such suggestions as you see fit to make will be appreciated.

ERSKINE RAMSAY,
Vice-President and Gen'l Manager,
Pratt Consolidated Coal Co.

Birmingham, Ala.

[The above draws attention to an exceedingly practical and important matter. Let COAL AGE readers suggest how an effective checking system of each miner's daily output of coal can be maintained without delaying the dumping of the cars. Or, it may be, someone can offer a substitute for the system suggested that will be equally effective in securing the loading of clean coal, as well as an accurate knowledge of the coal mined in different sections of the mine.—ED.]

Examination Questions

Pennsylvania Bituminous Mine Foremen's Examination, May 5 and 6, 1914

Ques. 1—What observations would you make on your daily examination of the working places in a mine?

Ans.—Observe closely the condition of the roof and coal face, to see that it is properly secured with the necessary timbers and sprags; observe the condition of the working face with respect to fine coal and refuse; observe the general manner in which the miner performs his work, keeps up his place, loads his cars, handles his supplies of powder, oil, timber and tracking and otherwise observes the rules and regulations of the mine. If safety lamps are used, observe carefully the condition of the lamp and manner of its use by the miner. If machines are used for cutting the coal, observe the manner in which this work is being done. Inspect all drill holes and shots to be fired and give necessary instructions to insure the safety of the men working in each place.

Ques. 2—What instruction, oversight and attention would you give the workmen on your daily rounds and what special attention must be given to pillar work?

Ans.—Besides what is mentioned in the previous answer, it is important to observe that each man has the needed supplies of timber, tracking, etc., to make his place safe and that he timbers his place promptly and securely. Careful attention should be given to see that each man performs his work in a safe manner. In pillar work, it is most important to see that sufficient timbers are set to secure the roof behind the men and prevent the falls from extending over the loose end of the pillar. It is also important to observe that the line of pillar work is kept fairly straight.

Ques. 3—Before hiring a workman in any capacity, what questions would you ask before giving him employment?

Ans.—Ask him for his certificate and references, if he has any; find out where he has worked before; in what capacity, and ascertain why he left that place. Inquire how he would proceed to timber his place, mine and load his coal; and ask him to explain his manner of charging and firing a blast. If safety lamps are in use, ascertain if he has had any experience in gas and give him a safety lamp to take apart and put together again. Give him a set of instructions to read and see if he can read and understand them to your satisfaction.

Ques. 4—What are the efficient limits to which the ventilation of a mine may be split?

Ans.—The velocity of the air current practically determines the limit of splitting or dividing the air. This limit of velocity at the working face varies under different conditions, but should seldom fall below 200 ft. per min.; and, in many cases, the velocity of the air current passing the working place should not be less than 400 or 450 ft. per min.

Ques. 5—State clearly what provisions should be made and appliances installed to insure a mine being thoroughly and efficiently ventilated, and state where such appliances should be placed.

Ans.—The ventilating equipment of a mine starts at the surface, although, in a few exceptional cases, a deep shaft and the absence of any gas may admit of furnace ventilation being employed, which, however, is not a safe or practicable system for use in a gaseous or a shallow mine. The mine ventilator located on the surface should be a fan of sufficient capacity to supply the required quantity of air against the necessary water gage, the latter being determined by the resisting power of the mine. If a mine is gaseous or dusty, there is the possibility of explosion; and, to prevent the destruction of the ventilating apparatus, explosion doors should be provided above the fan shaft. The fan should be set a sufficient distance back from the top of the shaft to avoid damage from any cause arising from its proximity to the shaft.

In the mine, air bridges, preferably overcasts, should be built at the mouth of each section of the workings, so as to provide a separate split of air, as early in its development as practicable. The air current should be properly conducted throughout the mine, by substantial air-tight doors and stoppings. The air should be made to sweep all working faces, and, wherever necessary, temporary brattices should be constructed to carry the air forward, or for the purpose of deflecting the air current into cavities in the roof or other void places. Regulators should be used to properly regulate the air so as to proportion the supply to the need in each section of the mine. Such regulators must be placed where they will not interfere with the haulage of coal.

Ques. 6—What provision should be made for the safe handling of explosives and detonators in mines, including transportation of the same?

Ans.—General Rule 13, Art. 25, of the bituminous-mine law of Pennsylvania, provides that no person shall carry into the mine, at one time, a greater quantity of powder or other high explosive than is required for use in one shift and such quantity shall never exceed 5 lb., except in the case of shotfirers requiring a larger amount to complete their work, as provided in Art. 16. It is also provided that all powder carried into the mine must be contained in metallic cans or canisters.

Art. 16 further provides that no powder or high explosive shall be stored in any mine. Black powder, for use in mines, must be put up in 5-, 10-, 15- and 25-lb. metallic cans, or canisters, or equally safe receptacles. No black powder, explosives or detonators shall be hauled on any electric motor trip, unless encased in boxes of non-conductive material. In dry and dusty mines where gas can be detected on the safety lamp, none but permissible explosives shall be used. No charge shall consist of more than one kind of explosive. The law provides that all permissible explosives, for use in bituminous mines, must be marked with the name of the manufacturer, name of the explosive, method of handling and full instructions for use. Detonators must at all times be kept in securely locked cases and separate from other explosives.

Coal and Coke News

Harrisburg, Penn.

Taking issue with the opinion of the Interstate Commerce Commission regarding the joint freight rates on what are known as industrial railroads or "tap lines," which roads connect with a great many bituminous mines, the Public Service Commission on May 14, decided that the proposed cancellation of established joint rates is not justified and should not, therefore, go into effect.

At the final hearing of this case on the above date, attorneys for trunk lines contended that under a ruling of the Interstate Commerce Commission there was ample justification for the withdrawal of joint rates heretofore maintained with the terminal connecting roads, while counsel for the Union and Monongahela railroads, the complainants in the case, were emphatic in their declarations that interstate commerce is not subject to the regulatory control exercised by the Federal Commission.

George S. Patterson, representing the Pennsylvania R.R., questioned the authority of the Public Service Commission to suspend the rates, which became effective on the above date. There is no empowering clause in the act creating the commission he asserted, and the Interstate Commerce Commission has already declared the practice of terminal allowance to be illegal.

Charles MacVeigh, general counsel for the United States Steel corporation, and representing the Union road and shippers along its lines, appealed for a just recognition of state rights, notwithstanding the Interstate Commerce Commission's decision.

In reviewing the case, it was shown the trunk lines allege, under the Interstate Commerce ruling, that delivery of cars at points of inter-change is actual delivery of cars at destination. Under the new tariff there will be an additional tonnage charge of 15 cents for hauls of only 14 miles, in many instances. In the Pittsburgh district, the region most affected in the case, there are approximately 30,000,000 tons of freight transported annually, the greater portion being coal and steel. An adverse decision means a yearly loss of $2,500,000 to the Monongahela Connecting R.R. and $5,000,000 to the Union Railroad.

The Lehigh Valley Answers Government

The Lehigh Valley R.R. on May 14, denied in the Federal Court that it had entered into combination or conspiracy to restrain or monopolize the production, transportation and sale in interstate commerce of anthracite trade, located along the lines of the company. The denial was set forth in the road's answer to the government's suit under the Sherman anti-trust law.

Another defendant company, the Delaware, Lackawanna & Schuylkill R.R. also filed answer, making denial of the charges that it is a party to any combination to restrain the anthracite trade. This road, 50 miles long, was acquired by the Lehigh Valley R.R. to serve collieries in the anthracite region.

Denial of similar character was filed on behalf of the various individual defendants, who are officials and directors of the company sued by the government, and who are personally mentioned in the government complaint.

The Lehigh Valley Coal Sales Co. and various other railroad and coal companies, which are defendants, filed their answer about two weeks ago.

In its general effect, the answer of the Lehigh Valley R.R. is a complete and specific denial of all the charges made by the government. The transportation of anthracite has not been moderately profitable, this company sets forth and up to the present time the owners have not received and are not now receiving a return commensurate with the value of their investment in the property.

The railroad company denies it owns or has ever owned anthracite lands in Pennsylvania or elsewhere, although it admits that some of its constituent companies were chartered by the State of Pennsylvania, both as railroad and coal companies. For many years, the answer asserts, it was the policy of the State of Pennsylvania, "to bring about a joint development of the anthracite mining and transportation industries."

The railroad company denies any domination of the Lehigh Valley Coal Co. or any other coal companies through stock ownership or otherwise, but asserts that the mines of the coal mining company are operated and its affairs are entirely controlley by officers who have no connection whatever with the railroad company. It is conceded that the president of the railroad company is the president of the coal company, but as president of the latter, the answer says, "he acts solely in an advisory way respecting the fiscal affairs of said company, and has never exercised any jurisdiction in regard to the mining or production or sale of coal."

Denial is made also that the road has been guilty of granting rebates or of charging unreasonably high rates for transportation of anthracite over its lines to the coal markets, or that the railroad company advised the coal company to organize a coal sales company or that any restriction was placed upon its stockholders when the Lehigh Valley Coal Sales Co. was organized.

PENNSYLVANIA

Anthracite

Edwardsville—Settling in the old workings of No. 3 shaft of the Delaware & Hudson Co. on May 9, caused a cave 10 ft. in diameter and more than 20 ft. deep on Summit Street, opposite two school houses, and for several hours the people of the neighborhood were driven from their homes and given much uneasiness. The most apprehension was felt over the condition of the gas and water mains on the affected street.

Minersville—While eating supper on May 11, the family of Mrs. Kerns, had a narrow escape from being swallowed into the old workings of William Penn Colliery. The earth suddenly caved under the front portion of their home and in their front yard to a width of 70 ft. the depression being 50 ft. in diameter. The house was pulled from its foundation walls and left on the brink of the pit.

Exeter—The Pennsylvania Coal Co. has erected at the old Schooley shaft, a most modern plant for the removal of water from this old abandoned operation. Two large pumps, electrically driven, are working to perfection. The water is now 200 ft. from the top of the shaft, and it is expected that in a short time the Checker seam may be entered. Gas has been encountered and a large fan has been installed for its removal. When the Checker is reached a large force of men will be put to work cleaning away the débris and rotted timber, replacing the same with new, preparatory to resuming mining. The shaft is about 500 ft. deep, but it is considered the worst part of the pumping is over.

Hanover—Representatives of the Taxpayers Association, which is composed of all the large coal companies, were unable to secure an injunction to restrain the commissioners of Hanover Township from letting contracts for the repairing of roads, entailing an expenditure of $100,000.

Scranton—There was a general exodus from their homes of the people living in the 600 Block on Luzerne St. on May 16, when the Lackawanna Coal Co. officials notified them that the neighborhood is threatened with a mine cave in the Bellevue Colliery workings.

Mahanoy City—James Brothers have leased the East Bear Ridge Mine near Mahonoy from the Girard Estate and will build shortly a breaker employing about 800 men.

Mt. Carmel—The Richard Colliery operated by the Susquehanna Coal Co. was the scene of a disastrous explosion on May 15, when one man was killed and seven more injured All the injured were taken to the Shamokin hospital. It is thought that one of the men opened his safety lamp and ignited the gas. It is also considered remarkable that more fatalities were not recorded, as not only the breast but the entire gangway was filled with gas when the explosion occurred.

Bituminous

Pittsburgh—The Conemaugh Smokeless Coal Co. has started the opening of a large development in Indiana Co. The contract involves the sinking of a 200-ft. shaft and the excavation of a slope 950 ft. in length, and will entail an expenditure of about $100,000. The tract of coal land embraces about 2000 acres and adjoins a tract of 3000 acres

owned by the Operatives Coal Mining Co. of Johnstown. The capacity of the mine will be about 200 tons of coal per day. The mine will be operated by electricity exclusively.

Connellsville—The strike at the Herbert plant of the Connellsville Central Coke Co. has been settled, but the plant is not being operated, having suspended because of lack of orders. No reduction in wages took place. The men who remain on the job to keep the plant in working condition are being paid the old wages. The shut-down is indefinite but is not expected to last for any considerable length of time.

Marianna—The mines here which have been shut down for some time may be re-opened shortly. Large numbers of men have been out of work for months and times have been hard.

Wishaw—A part of the air-shaft at No. 1 Mine caved in recently and a number of timbers dropped into the shaft. Although it will take some time to complete repairs and get the mine in shape for running, the damage is not as extensive as was at first reported. It was rumored shortly after the accident that the fan had fallen into the air-shaft.

Cresson—One of the mine cages at No. 9 shaft of the Pennsylvania Coal & Coke Corporation fell nearly 800 ft. down the shaft May 14, when the hoisting rope broke. The cage and the loaded car which it contained were completely wrecked. Fortunately no workmen were injured, but it was night before sufficient repairs could be made to hoist the miners out of the shaft.

WEST VIRGINIA

Wellsburg—Mine No. 3 of the West Virginia-Pittsburgh Coal Co., formerly known as La Belle mine, near this city, is shut down on account of the strike of practically all of the men working in it. Some violence has occurred, several men having been attacked by the strikers.

Charleston—After meeting May 15 for further consideration of the wage scale between the miners and operators of the Kanawha field, the joint sub-scale committee adjourned until May 25, upon which date another attempt will be made to adjust the existing differences. In the meantime the miners in the Kanawha field who walked out on an unofficial strike have been induced to return to work pending a settlement.

Kingwood—It is stated that the Preston Coal Co. located at Independence will soon be able to resume operations upon a full scale. The company owns several hundred acres of coal, and a new plant said to be one of the most modern in the state will shortly be completed when employment will be given to some hundreds of men.

Bluefield—In the first aid contest held in Bluefield, May 13, under the auspices of the Pocahontas Operators Association, the first prize was won by the team from the Louisville Coal & Coke Co. at Goodwill, the second, by the team from the Pocahontas Consolidated Collieries Co. at Maybeury while the third place was taken by the team from the No. 6 Works of the United States Coal & Coke Co. at Gary. In the one man event George E. Wysor, of the Crane Creek Coal & Coke Co., C. C. Bailey, of the Louisville Coal & Coke Co. and T. J. Burwell of the Pocahontas Consolidated Collieries Co. tied for first place, all making perfect scores. It has been arranged that this tie shall be decided in another contest to be held in Bluefield on May 30 next. Sixteen teams including a colored team and a woman's team participated in the contest.

ALABAMA

Birmingham—The property of the Wadsworth Red Ash Coal Co., comprising about 1200 acres of rich Cahaba coal land near Falliston, Shelby County, Alabama, has been purchased by R. N. McDonough, J. H. McDonough and J. T. Robertson, all of Birmingham, the consideration being about $175,000. It is the intention of the new owners to continue the name of the old company and to double the capacity, which is now 200 tons per day, as rapidly as possible. Stephen H. Green will continue as general manager of the new company.

KENTUCKY

Louisville—After nearly two months of lagging negotiations the operators and union miners of the Western Kentucky coal field agreed recently on the terms of a contract as to wage scale and working conditions to run for two years from Apr. 1, last. The three points, which, had been the principal bones of contention were at length decided as follows: Mule drivers shall draw 10 cents more each day and the operators will pay for and own the harness; the operators shall have the right to change the method of computing wages from the "run of mine" to "screened coal" at any time they see fit, except during the course of a working day; the operators shall have the right to change the method of cutting from the "ton" to the "square foot" upon a day's notice.

OHIO

Logan—A general appeal has been sent out on behalf of the miners in this vicinity, who have not been working since the general suspension on Apr. 1, and who had worked on short time for months prior to that date. It is said that women and children are in many cases insufficiently fed and clothed, and that help is badly needed. The appeal is signed by the committee in charge of the work of collecting supplies and cash contributions necessary to relieve the distress existing.

Columbus—Negotiations by which John S. Jones, of Chicago, Ill., and Newark, Ohio, as head of a syndicate was to take over the Sunday Creek Co. properties, have been declared off. Although the sale was announced last week as being practically closed, some of the details could not be agreed upon when it came to preparing for the transfer. There are reports that the affair will be reopened. Recent rulings of the federal court, growing out of the Sunday Creek Co.'s former relations with the Hocking Valley Ry., demand some form of reorganization for the big coal corporation.

Martin's Ferry—Miners in the eastern Ohio field are considerably interested in the report from attorneys that the new wage-scale agreement cannot contain a check-off clause. It is said that the Longshoremen's Act recently passed by the legislature will not allow a workman to sign away his wages.

Farmers in the mining section of Belmont Co. are blaming the strike of the coal miners for the many robberies being committed. It is said that chickens and live stock are special objects for theft.

INDIANA

Sullivan—The Monon Coal Co. has begun sinking shafts at the Steel Tipple and Mammoth mines to vein No. 5, the others having been mined out. Walter Bledsoe and A. T. Bennett, of Chicago, have leased the Baldridge mine near Farmersburg and will reopen it. The Peabody-Alwert Co., which operates the Reliance mine, near Shelburn, has dissolved partnership, Mr. Alwert taking over his partner's interest.

Linton—The Vandalia Coal Co. recently announced that it would start two more of its mines immediately. This will give employment to about 500 idle workmen.

ILLINOIS

Herrin—The Chicago & Carterville Coal Co. is rebuilding its washer at mine A at this point, entailing an expenditure of several thousand dollars.

Harrisburg—The Illinois Mine Rescue Car No. 3, from the Benton station, which has been in Harrisburg for the past month, has completed the work here and gone to Eldorado. During the time the car was at Harrisburg, Messrs. Scott and Nicholls trained 26 men in first aid and helmet work.

East St. Louis—Fines aggregating $15,000 were assessed against the "Big Four" and the Indiana Harbor lines when they pleaded guilty in the U. S. District Court on May 14 to charges of rebating and conspiracy. Each road was fined $7500. This virtually completed the cases which grew out of the government's investigation in which three railroads were charged with making discriminatory rates for hauling coal mined by the O'Gara Coal Co., of El Dorado, Ill. The third railroad, the Grand Trunk, several months ago pleaded guilty to charges of rebating and was fined $5000.

Canton—The coal mines of Illinois are again in operation after a delay of several weeks awaiting an adjustment of the new wage scale. The operators state that the new agreement is satisfactory and that no labor troubles are anticipated. The demand for coal is also reported good. In the signing of the contract, while both sides had to make numerous concessions, the operators are pleased that no material increase in the cost of production has been entailed, and the miners are glad to have gained improved working conditions.

Pekin—A petition of creditors was recently filed in the U. S. Courts to have the Champion Coal Co. of Pekin adjudged bankrupt. It is believed that the liabilities will approximate $6000 and the assets are expected to be in an equal amount when the schedules are filed. Ira J. Covey is the representative of the petitioning creditors.

ARKANSAS

Little Rock—Petitions bearing over 18,000 signatures to establish a miners qualification law under the initiative and referendum acts were recently filed with the secretary of state. This qualification measure would provide for the es-

tablishment of a board of examiners for coal miners, and also for numerous other reforms advocated by the Arkansas Federation of Labor.

Prairie Creek—Attorney General McReynolds has authorized the use of United States deputies as mine guards to protect the property of the Mammoth Vein Coal Co., at this place. The miners are locked out and there is a rumor that the operators intend to resume operations on the open-shop plan.

RECENT COAL AND COKE PATENTS

Coal and Gas Furnace. M. J. Farquhar, Wilmington, Ohio. 1,088,559. Feb. 24, 1914. Filed Dec. 16, 1909. Serial No. 533,375.

Chimney Cap. W. L. Carter, Waterloo, Iowa. 1,088,060. Feb. 24, 1914. Filed Apr. 12, 1913. Serial No. 760,679.

Draft Regulator for Furnaces. J. Hefferon, Cheyenne, Wyo. 1,088,572. Feb. 24, 1914. Filed Apr. 24, 1913. Serial No. 763,403.

Coal-Leveling Machine for Bee-Hive Ovens. W. Sangster, assignor to Covington Machine Co., Covington, Va. 1,089,675. Mar. 10, 1914. Filed July 7, 1908. Serial No. 442,306.

Bucket Conveyer. M. A. Kendall, assignor to Stephens-Adamson Mfg. Co., Aurora, Ill. 1,090,156. Mar. 17, 1914. Filed Aug. 10, 1911. Serial No. 643,358.

PERSONALS

Wade Harley, a coal mine foreman operating near Adrian in Upshur County, West Virginia, was shot and severely wounded by an Italian on the evening of May 14.

Joseph Northover, of Seanor, Penn., has been promoted from assistant mine foreman to mine foreman at the Eureka No. 39 mine of the Berwind White Coal Mining Co.

Colonel William Leckie recently purchased 200 acres of coal land in Pike County, Ky., and will shortly open a coal operation under the name of the Douglas Coal Company.

Benjamin Allen, mine examiner of the Black Diamond Coal Co. was killed by an explosion of firedamp on Sunday night, May 10, at about 10 o'clock p.m. Mr. Allen was considered a very careful mine examiner.

J. W. Galloway, vice-president of the Maryland Coal Co. of West Virginia was recently elected president of that firm at a meeting of the directors held in New York. He succeeds William H. Ziegler who resigned some time ago.

J. H. Woodward, president of the Woodward Iron Co., who has been for some weeks ill at his winter home at Orlando, Fla., has returned to his Birmingham home much improved in health. It was feared for a time that he would not recover.

Wm. Nicholson, for many years deputy mine inspector in West Virginia, has accepted a position with the New River Collieries Co. This places him in entire charge of the underground working of the mines at and near Eccles. Mr. Nicholson has resigned his position with the Jewell Ridge Coal Co., and after a short vacation will enter upon his new duties.

CONSTRUCTION NEWS

Benham, Ky.—The Wisconsin Steel Co., Benham, Ky., announces the further extension of the Wasioto & Black Mountain R.R. and the opening of a new coal development on Poor Fork, three miles from the Benham plant. Work is to be started within 30 days.

Kingwood, W. Va.—It is reported that the work of opening the big mine of the Kingwood Collieries Co. at Snyder will be commenced soon. The output of this company will be large and many men will be employed. The general offices will probably be located at Kingwood.

Pound, Va.—The Indian Creek & Pound River R.R. has been purchased by Knoxville and Bristol capitalists who announce a 12-mile extension of the road from Pound to Freeling, Va., to open an extensive coal and timber area. A large coal plant and an extensive lumber mill will be installed within six months.

Whitesburg, Ky.—The Roberta Coal Co., with hearquarters at Baltimore, makes the announcement of another new development near Thornton or Sargent, Ky., the exact location yet to be determined. A short line branch of railroad will be necessary. June 1 is the day named for the beginning of the development work.

Pittsburgh, Penn.—Contractors at work on the construction of the Montour R.R., which reaches the new coal mines of the Pittsburgh Coal Co. in Allegheny and Washington counties expect to have the road completed by July 1. The road will be 52 miles long, and will reach a field that has for years been held in reserve.

Whitesburg, Ky.—One thousand men are at work at Haymond on the construction of the industrial city which the Mineral Fuel Co. is erecting there. The company has just added a big planing mill to the band-saw mill which has been in operation for some time and is pushing operations. Rapid progress is being made in construction.

Hanlin Station, Penn.—A Pittsburgh coal mining company has recently driven stakes for the erection of a tipple to develop a large territory at this place. This structure will occupy the same location as one erected here some 25 years ago by the Keystone Coal Co. Work will also be started at once for erecting houses for miners.

Hazard, Ky.—The Ashless Coal Co., recently organized, will make an extensive coal development near Hazard, three miles from the Lexington & Eastern R.R., and will build a three-mile branch of the road out to the property, the construction to be started at once. The coal plant will have a capacity of 2500 tons per day from the start.

Whitesburg, Ky.—Track laying on the Younts Fork, Potters Fork and Bottom Creek branch lines of the Lexington & Eastern R.R. from Fleming to Naymond and Hemphill, is being pushed with all possible speed. Within a short time all three branch lines will be completed and in operation. At least 60,000 tons of coal is now mined and ready to be shipped out.

St. Louis, Mo.—Work was started May 11 on the 56 coke ovens, to cost $750,000, for the Laclede Gas Light Co., on South Broadway, adjoining the city limits. The ovens will form a row 30 ft. wide and 300 ft. long. Each oven will be 22 in. wide inside, 29 ft. long, and between 8 and 9 ft. deep, and will hold 14 tons of coal. In addition to the coke ovens, a holder is being built to contain 1,000,000 cu.ft. of gas.

Brownsville, Penn.—Improvements aggregating about half a million dollars are to be made at the Alicia coke plant of the W. H. Brown interests, two and half miles south of Brownsville. It is proposed to let a contract for 400 ovens within the next few days. These will cost approximately $700 each. It will be necessary to build new tracks, increase the power plant, and provide other necessary and extensive equipment to meet the additional output.

Columbus, Ohio—The construction of the proposed 40,000-hp. electric power plant at Floodwood, Ohio, which is backed by English capitalists, and which will furnish power to a large number of coal operations in the Hocking Valley field, seems practically assured, as Herman Gamper, who is in charge of the project, states that a market for the current is assured under contracts already made, sufficient to warrant the construction of the plant. It is believed that some of the units will be in operation by November.

NEW INCORPORATIONS

Knoxville, Tenn.—The Climax River Coal Co. has been incorporated with a capital stock of $5000. The incorporators are Nell S. Jenkins, Kyle B. Jenkins, Charles Jenkins, E. P. Luttrell, and J. H. Frantz.

Dayton, Ohio—The S. J. Patterson Pocahontas Co. has been organized for the purpose of mining coal. The capital stock is $75,000, and the incorporators are S. J. Patterson, H. J. Cresse, E. L. Fleming, D. E. Durnell, and H. B. Cromer.

Pineville, Ky.—The Straight Creek-Bell Coal Co. has been organized here with $50,000 capital by J. T. Asher, F. N. Asher and others for the purpose of developing Bell and Harlan County coal properties. Developments will be started during the summer.

Philippi, W. Va.—The High Carbon Coal Co. has been organized with a capital stock of $75,000 for the purpose of mining coal. The incorporators are S. A. Moore of Charleston, William G. George, R. E. Talbott, H. J. Wilcox and J. B. Ware, of Philippi, W. Va.

INDUSTRIAL NEWS

Hellier, Ky.—The Rockhouse Mining Co. has made an increase in its Hellier plant and is now shipping 75 cars per day. This is soon to be increased by 100 or more cars daily.

Richardson, Ky.—The T. J. Philips Coal Co., which lately incorporated, has purchased 2340 acres of coal land near here for development. T. J. Philips is the president and manager and L. R. Swain secretary and treasurer.

Somerset, Penn.—The Consolidation Coal Co. is said to have recently booked orders for 1,140,000 tons of Somerset County coal for the South American trade. This means that all the mines will be worked to capacity during the current year.

Evansville, Ind.—The Spacer Epperson coal mine, a few miles east of this city, which was appraised by the Warrick County Circuit Court at $23,000 was recently sold at public auction to William Epperson for $1500, he being the only bidder.

Cincinnati, Ohio—An extension of time until Oct. 15, 1914, has been allowed the Chesapeake & Ohio Ry. Co. in which to sell its holdings in the Kanawha & Michigan Ry. Co. The original time set for disposing of these holdings expired May 13.

Fayetteville, W. Va.—The Logan Mining Co. has closed a lease on the Lawson tract of 1100 acres on Main Island Creek. This area will be developed together with the Covey tract which it adjoins by a 200 ton mine. The development will be begun immediately.

Connellsville, Penn.—The Republic Iron & Steel Co. recently shut down 50 of its 400 beehive ovens at the Republic plant in order to ship coal to its recently completed by-product ovens at Youngstown, O. It is understood that this suspension is only temporary.

El Paso, Tex.—American soldiers on duty at the International Bridges have a strenuous time when coal is being shipped across the boundary. Fuel is being imported in considerable quantity for the Mexican railroads, and each carload of coal has to be shifted and probed in a search for hidden rifles and cartridges.

Hazard, Ky.—The Slemp Consolidated Coal Co. has leased another 1000-acre coal tract near Hamden to Pennsylvania and Maryland capitalists who will start at once the development of the property. A good-sized coal plant will be established. The work will be directly on the line of the Lexington & Eastern Railroad.

Cornettsville, Ky.—The Cornettsville Coal Co. has been organized by Arch Cornett, T. S. Tarbell and others with a capital stock of $40,000 for the purpose of making extensive coal developments on Big Leatherwood Creek, five miles from here. A short branch line of the Lexington & Eastern will be built to reach the new coal operation.

Jenkins, Ky.—The Consolidation Coal Co. has made an increase in tonnage at its 201, 202 and 203 mines at Burdine, three miles from here, and is now shipping 125 cars per day. Another increase will be made, it is said, by June 1, and all the company's plants in Jenkins, Dunham and McRoberts will make big increases soon afterward.

Mater, Ky.—The Elkhorn Coal Co., recetly organized by J. Henry Hall, C. L. Bastin and others, of Lexington, is beginning the mining of coal, building miners' houses, tipples, etc., and will be shipping within three weeks. This work is directly on the Lexington & Eastern R.R. Several hundred hands will be employed when the operation is in full swing.

Washington, Penn.—Owen Murphy, who is developing the coal interest on Coon Island, has purchased the Pittsburgh coal underlying the farm of the late Henry Cain, containing 222 acres. This tract is well located for development. The coal measure where the shaft is being excavated is 412 ft. below the surface. The work is progressing in good shape.

New Orleans, La.—Pierre Lacaze, vice consul of France at New Orleans, recently stated that the French Government had purchased a large tonnage of Alabama coal for its vessels in Mexican waters, and that probably a much larger tonnage would result a little later on. He stated that the French Government saved $2 per ton by buying the Alabama fuel.

Toronto, Ont.—The Grand Trunk Pacific Ry. recently let the contract for the new coal dock to be erected at the mouth of the Mission River at Fort William, Ont., to the Thunder Bay Contracting Co. The cost will be about $1,250,000. The buildings will have a capacity of 100,000 tons of anthracite, and equal amount of bituminous, in addition to the unroofed storage yards.

Birmingham, Ala.—The Maryland Coal & Coke Co. recently purchased the business of W. G. Coyle & Co., Inc., coal dealers of New Orleans, La., including all retail yards, docks, barges, tugs, etc. The deal involved several hundred thousand dollars, and was made to provide a market for the company's Sipsy River coal, which it is expected will largely go to export.

Cincinnati, Ohio—As a result of the establishment of a new management for the "Big Four" R.R. independent of that of the New York Central Lines, it is authoritatively stated that the coal and ore department headquarters will be removed from Chicago to Cincinnati. H. M. Griggs, general coal and ore agent, with his entire force, will maintain headquarters in Cincinnati, with branches in Pittsburgh and Cleveland.

Bluefield, W. Va.—The statement issued by Comptroller Cox covering the shipments of the Pocahontas coal field for the month of April shows these exceeded the shipments of the corresponding month for 1913 by about half a million tons. The total shipments during April, 1914, aggregated 2,117,286 tons, as compared with 1,534,220 tons for April, 1913. Up to the present time, the appearances indicate that May, 1914, will run far in excess of the corresponding month of last year.

Ashland, Penn.—One of the largest transfers in anthracite coal properties in this vicinity in recent years, occurred on May 16, when Abel I. Culver, of New York, purchased the holdings of the Shipman Coal Co., owners and operators of the Colbert Colliery, consisting of 500 acres of virgin coal land with deposits of almost 20,000,000 tons. The average yearly production is about 225,000 tons. The former owners were John B. Corliss, of Detroit, Mich., Robert E. Carter and J. M. Stauffer, of Hazleton, Penn.

Youngstown, Ohio—Byproduct gas produced at the new coke ovens of the Republic Iron & Steel Co. is said to be displacing producer gas and coal at the company's Lansingville, mills, and connections are being made in order to enable other mills and open-hearth furnaces to use this fuel. A large coal consumption will be displaced by the use of this by-product of the company's coke ovens, besides considerable natural gas.

Jackson, Ohio—Decrease in mining activity throughout this field as the result of exhaustion is the reason given by the Hocking Valley Ry. Co. for abandoning an electric railway between Jackson and Wellston. The line is 10 miles long and has been operated electrically for nearly 20 years. There were hourly trains, the patronage coming largely from the mining camps, but the company claims the road is now a losing proposition. Taking effect May 25, the electrical equipment will be entirely discontinued, but for the purpose of holding the franchise, temporarily at least, a few steam trains a day will be run. Some of the communities which bought lighting service of the company will be in darkness until other arrangements can be made.

La Follette, Tenn.—Edward V. d'Invilliers, a coal-mining expert of Philadelphia, together with his associates, Walter Gilman and J. B. Dilworth, are making an inspection of the coal and coke properties of the La Follette Coal, Iron & Ry. Co., at La Follette, Tenn., in the interest of the bondholders, the Electric Corporation, the Old Colony Trust Co., and the American Trust Co., all of Boston, Mass. This firm was placed in the hands of Neil Robinson, of Charleston, W. Va., as receiver on Dec. 23 last, by whom it has been since operated chiefly to furnish coking coal for the La Follette Iron Co., which firm operates the furnaces, ore mines, stone quarries, coke ovens, coal washers, etc., under lease from the La Follette Coal, Iron & Ry. Co., the latter firm furnishing the coal to the Iron company under contract.

Birmingham, Ala.—Looking to submitting bids for a big supply of coal to the United States Government, through the port of Galveston, for use during the presence of the fleet in Mexican waters, representatives of the coal-mining interests of Birmingham are now in New Orleans. Some of the larger corporations have gone so far as to make arrangements for the handling of large quantities of coal through Pensacola or New Orleans, and for loading same at Galveston on government vessels. Capt. W. O. Smith, army quartermaster at New Orleans, will open bids within a few days, the stipulation being the producer must be in a position to furnish at least 10,000 tons, if not more, every month. The bidding is open to all coal concerns in the South able to fulfill the conditions. Tests have recently been made at Pensacola by the government, and while there is no information as to the necessary qualifications, it is understood that the Alabama coal stood the test well.

Coal Trade Reviews

General Review

Anthracite slowing down into the customary midsummer dullness. Distress prices prevailing on bituminous, but surplus stocks are nearly exhausted and there is a more hopeful feeling. Lake shipments make a big increase.

The domestic grades of anthracite continue in moderately good demand, but the steam sizes are under steadily increasing pressure. The May circular is generally maintained on the prepared grades, but the agencies are now openly seeking for business, and the next move will be a restriction in the production. It is evident that the customary midsummer dullness is now close at hand. Orders are generally plentiful for the current month, but the outlook for next month is not encouraging by any means. Any unusual dullness is ascribed partially to the tight money situation which is making it inconvenient for buyers to accumulate stocks as in previous years.

There has been a further sharp decline in tidewater bituminous quotations at down East points, where the market seems to be on the verge of the utter demoralization which has characterized previous dull seasons. With the distress prices now prevailing, consumers not already contracted will prefer to take their chances in the open market for the time being at least. The demand is down to the vanishing point and the market is as dull and flat as it is possible to imagine. Even the steamship demand has eased off. Consumers generally show no anxiety over delays in shipments on contracts, and there is scarcely any movement from the mines, except on specific orders.

A heavier movement in the Lake trade has resulted in an increased production in the Pittsburgh district particularly as regards the larger interests, many of whom are under nearly full time operations. Ostensibly circular prices are ruling, but it is known that occasional concessions are offered. There are no favorable indications of any increased consumption, and the conservative operating interests are quietly looking around for some temporary business at moderate prices to carry them over the dull period.

Although the Ohio market continues at a complete standstill, operators are expressing anxiety as regards their Lake contracts, which they are in danger of losing unless they are able to resume operations shortly. A plentiful supply of vessels is now available in the Lake trade, and all the demurrage coal at the loading ports has been cleaned up.

As a result of an excellent week dumpings at the Hampton Road piers the supplies in the local yards there is below normal and circular prices are being generally maintained as a rule. A decidedly optimistic feeling also prevails in the Southern market due partially to some heavy government orders for American warships operating in Mexican waters, and likewise to some inquiries from foreign governments for the same purpose. It is generally thought that the bottom corner of the trade has been turned, and a more hopeful feeling prevails over the future.

The Middle Western consumers appear to be reaching the end of their surplus stocks and the market seem to be slightly better. The wage scale question has now been definitely disposed of throughout the Middle Western states and mines are gradually getting under operation again. Prices as a rule are somewhat steadier, though weak at certain points.

EASTERN MARKET

Delivered price materially less and market for Pocahontas and New River is on the verge of being demoralized. Extraordinary dullness prevails on all grades. Marine freights low. Anthracite quiet; the shippers running short of orders.

Bituminous—To some degree the expected has happened. Prices alongside and on cars at practically all the New England ports have receded materially during the past week. While the $2.85 f.o.b. price has not yet been shaded on f.o.b. sales, there can be no further pretence of netting back anything like that figure on the orders recently closed on a delivered basis; $3.40 on cars at Providence, $3.30 or less alongside Boston, and $3.70 on cars Bangor, the latter for deliveries to Dec. 1, cannot by any possibility yield $2.85, f.o.b. Norfolk, and the indications are that still lower figures will be made the next fortnight or so. Various West Virginia operators have apparently concluded it is better to keep mines running and get what prices can be had. It really looks as if the market in this territory were on the verge of demoralization.

Meanwhile, the consumers who did close contracts are increasingly dilatory about accepting deliveries. The supply of water for the textile mills is the highest of recent years and instances could be multiplied of plants that on that account are using only 10@15% of their normal amount of fuel. The uncertainty of fall business for many kinds of manufactures is another factor in a situation that is almost unparalleled for summer dullness.

The call for Pennsylvania grades is almost at the vanishing point, the scattering business that offers being mostly confined to Pocahontas and New River. Operators are not loading cars except on firm orders; the risk of demurrage is too great.

Marine Freights are quiet. So much coal is standing at all the shiping ports that record dispatch prevails and that means quicker trips and more coal brought forward. The result is that shippers are at a loss to place steamers and some low rates have been quoted. Large schooners can be had at 55c., Hampton Roads to Boston.

Anthracite—Orders are being sought now by practically all the companies except on stove size. There is no gossip on prices, the May circular being rigidly maintained in all directions. A restriction of mining is the next move looked for.

Bituminous prices at wholesale are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*.....	$0.90@1.50	$1.20@1.65	$1.67@1.77	
Philadelphia*.....	2.15@2.75	2.45@2.90	2.92@3.02	
New York*.....	2.45@3.05	2.75@3.20	3.22@3.32	
Baltimore*.....	.....	.....	2.85@2.95	
Hampton Roads*.	.....	.....	.....	$2.80@2.85
Boston†.....	.....	.....	.....	3.40@3.70
Providence†.....	.....	.....	.....	3.50@3.78

* F.o.b. †On cars.

NEW YORK

A discouraging dullness still characterizes the bituminous market. However, close observers report surpluses exhausted while there is a tendency to hold tonnages closer and a better feeling prevails. Anthracite slowing down.

Bituminous—The New York soft-coal market is about as dull and flat as it is possible to imagine. Even the steamship business has slowed up perceptibly, and consumers under contract show no anxiety whatever even when their shipments get one to two weeks behind. There is scarcely any business being negotiated on new contracts, buyers not already covered preferring to take their chances in the open market for the time being at least. Slack coal which was in such heavy demand last year has fallen off to 40c. a ton while some Western Maryland coal has been offered in the local market at $1.85 with no buyers. Mines in the Central Pennsylvania district are operating at probably 40 to 50 per cent. capacity.

But even in the face of all these adverse conditions, it is a notable fact that the market is being relatively well maintained, at least as compared with the utter demoralization which has characterized other dull seasons. The general feeling prevails that there is a great deal of coal at tidewater, but if there were a normal market, the supply would be entirely inadequate. In fact authentic reports are to the effect that the accumulated surpluses are now practically all cleaned up. There is little or no tonnage coming in on consignment, shippers refusing to risk such shipments under prevailing market conditions; as a result, there is not so much demurrage coal reported. Stocks are being generally kept low.

The market continues quotable about as follows: West Virginia steam, $2.50@2.60; fair grades Pennsylvania, $2.60@2.70; good grades of Pennsylvania, $2.70@2.80; best Miller Pennsylvania, $3.10@3.15; Georges Creek, $3.15@3.25.

Anthracite—Full time operations continue the rule in the hard-coal regions, but the customary mid-summers dullness is already becoming evident. The domestic grades are mostly in active demand, but there is more pressure on the steam sizes and some restriction in operations next month seem to be inevitable.

In the prepared grades, stove coal is the only size that is generally active all along the line. Egg coal, which was in such good demand a few weeks ago, has now slowed up materially, while chestnut is also in long supply. Pea coal is heavy while the poor grades of barley are selling at figures which will scarcely cover the freight charges, and rice is about the same.

We quote the New York hard-coal market on the following basis:

	Upper Ports		Lower Ports	
	Circular	Individual	Circular	Individual
Broken	$4.70	$4.55@4.70	$4.65	$4.50@4.65
Egg	4.95	4.95@4.95	4.90	4.80@4.90
Stove	4.95	4.95@4.95	4.90	4.90@4.90
Chestnut	5.20	5.05@5.20	5.15	5.00@5.15
Pea	3.55	3.25@3.55	3.45@3.50	3.20@3.45
Buckwheat	2.80	2.65@2.80	2.50@2.75	2.10@2.75
Rice	2.30	2.30@2.30	2.00@2.25	1.75@2.25
Barley	1.80	1.65@1.80	1.70@1.75	1.25@1.70

PHILADELPHIA

No marked change in anthracite situation, although there is a tendency toward dullness as the season progresses. Prospects not considered good for June, and curtailed mining possible. Bituminous on a parity with week previous, with no improvement in sight.

Anthracite—As the season progresses, it is becoming more apparent that with the close of the month of May, there is likely to be a period of dullness lasting through most, if not all, of the summer months. This is indicated by a perceptible falling off in the placing of orders. It is understood that the operators are fairly well filled up with orders, sufficient to carry them over the current month, without recourse to curtailment, but the situation looks anything but favorable for the ensuing month, and it is feared that the market can be well taken care of by short-time work at the mines.

This dullness is probably due to the fact that many householders are postponing the filling of their bins until the fall. It is a fact that many people who have heretofore purchased their supplies in the spring, are simply buying as necessity requires, instead of placing orders for their entire requirements. Lack of industrial activity may be responsible for this, in a measure.

It is understood that the market is absorbing the output of egg, stove and broken, but chestnut still continues to drag, and it is only with a hard pull, and liberal concessions on the part of the individual operators that this latter size is moving off. As indicated last week, steam sizes still continue to flood the market, and concessions of 25 to 30c. per ton are currently reported.

Price at tidewater are as follows:

	Circular	Individual
Broken	$4.35	$4.35 @ 4.45
Egg	4.60	4.60
Stove	4.60	4.60 @ } 4.70
Chestnut	4.85	4.70
Pea	3.25	3.00

Bituminous—The last week witnessed no change in the soft-coal situation. As a matter of fact, conditions seem to grow worse, instead of better. Industrial establishments are buying from hand to mouth, rather than enter into new contracts at the present figures demanded.

BALTIMORE

Production heavily curtailed to avoid surpluses. The hard-coal men are also complaining that business is light.

During the week just closed a half dozen more foreign charters were announced for late May shipment, and the prospect is that this class of business will show a heavy total for the month. The coastwise movement to the north is largely restricted to company-owned colliers, while southward the sailing vessel delivery is a feature

Mining districts of Pennsylvania and West Virginia are still busy urging coal upon agencies and consumers. Production has been largely cut to prevent surpluses. West Virginia slack was in somewhat better demand, several Western industries of importance having entered the field for this fuel. Slack was selling around 55c.; run-of-mine at 80c. and three-quarter at 85 to 90c. Pennsylvania low-grade fuels are offering at unprofitable prices in many cases at from 95c. to $1. Little or no change was noted in better fuels, selling to the trade at from $1.15 to $1.35.

Hard-coal men are also complaining of rather poor business. The spring ordering is not as brisk as it might be. The solid foundation of the anthracite trade, however, make it certain that any ground lost now will be made up by heavier business in mid-summer and early fall.

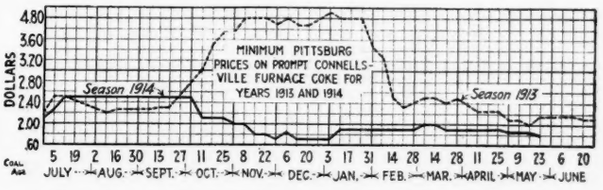
CENTRAL STATES

PITTSBURGH

Coal production increased, and nearing 60% of capacity. Lake shipments larger, demand being otherwise very poor. Prices fairly well maintained, particularly on contract. Connellsville coke stagnant with prices weak and production exceeding shipments.

Bituminous—Coal production in the Pittsburgh district is up to between 50 and 60% of capacity, contrasting with a rate of about 40% ten days ago. The largest coal interest is operating at 60% or more, but a number of the smaller ones are either closed or working at a low rate.

There has been no increase in consumption either by railroads or by industrial plants, while domestic consumption has, of course, decreased further. A slight improvement in demand has occurred through the further exhaustion of stocks, but these are still fairly important. The chief improvement has been by reason of heavier shipments in the lake trade. These are now of moderate volume, though still well below the average for this date. The Northwest does not seem to be much in need of coal, and the lake season as a whole promises to involve a light tonnage, though the rate toward the close of the season may mount up to normal.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DOLLARS
MINIMUM PITTSBURG PRICES ON PROMPT CONNELLSVILLE FURNACE COKE FOR YEARS 1913 AND 1914
Season 1914
Season 1913
5 19 2 16 30 13 27 11 25 8 22 6 20 3 17 31 14 28 14 28 11 25 9 23 6 20
JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APRIL MAY JUNE

Reports generally are that full prices are being obtained, but there is still some cutting, particularly in slack, caused by increased production of slack through the heavier lake shipments. Regular prices, which are quite well maintained for contracts, are: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.50, per ton at mine, Pittsburgh district.

Connellsville Coke—The market continues stagnant. There is practically no demand for furnace coke, either prompt or contract, and odd lots are frequently offered at under the regularly quoted market without finding takers. Consumers manifest no interest whatever in contracts for second half. Few foundry-coke contracts are being negotiated for the twelvemonth beginning July 1, though the great majority of contracts expire at that time. The market is quotable approximately as follows: Prompt furnace, $1.80@1.90; contract furnace, $2; prompt and contract foundry, $2.35@2.50 per ton at mines.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended May 9 at 312,100 tons, an increase of 6490 tons, and shipments at 291,166 tons, a decrease of 8273 tons. Production appears to have exceeded shipments by 20,934 tons.

BUFFALO

Miners accept old scale and return to work. Prospect of much surplus coal unless operators are cautious. Mines must prepare to meet slack conditions. Anthracite only fairly active. Coke unchanged.

Bituminous—There is no particular improvement in the trade and none can be expected until the surplus is much reduced. The mines tributary to this market are practically all active again, though the operators protest that they are not going to produce coal any faster than they can sell it. But there is quite an amount of it at different points awaiting disposition, some of which is paying car service, although Buffalo is not so overstocked as certain Canadian points. Most of this coal comes from a few sources, the operators seeming to be willing to suppose that they will come out better next time. The rule is to run the mines somewhat more than is necessary to take care of contracts and depend on semiregular customers to absorb the balance.

The prospect is for a slow market for an indefinite time. The lake trade is as dull as any other and there is no indication of any increase of consumption in any line. From present indications nothing to be expected beyond a possible slow improvement late in the season. Conservative coal operators and jobbers are looking for a few contracts and regular orders at living prices, pending a return of better conditions. Quotations remain weak on the basis of $2.80 for Pittsburgh

lump, $2.70 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny valley sizes about 25c. lower.

The Allegheny Valley operators and miners, at a meeting on May 12 signed an agreement to continue the old wage scale for two years longer. The only change was to put the blacksmithing charge on a tonnage basis.

Coke—The coke trade is not active and shows no indications of improvement. Prices being at the bottom, do not change as makers of the best coke refuse to make further reductions. Quotations remain on the basis of $4.50 for best 72-hr. Connellsville foundry.

Anthracite—The demand is moderate in general, though the supply is not liberal. It is stated that the mines are not running full and that the tidewater demand is stronger than it is Westward. Some jobbers of independent anthracite report that they have difficulty in obtaining enough to fill their orders. The Canadian demand is still light.

The lake shippers are not getting much coal and are handicapped by the scarcity of small vessels, which are wanted for minor ports. Lake shipments for the week were 102 000 tons. The amount reported includes some cargoes that should have been put into last week's list.

COLUMBUS

Interest centered on the court's decision on the screen law. Ohio operators fear they will lose Lake contracts while considerable outside coal consigned to the Lakes is backing up into the regular market because of the shortage of vessel tonnage.

At this writing operators are anxiously awaiting the decision of the Federal court judges, advising whether or not the mine-run law shall become effective on May 20. Arguments on the restraining order were made May 2 and all negotiations between miners and operators are being held in suspense for the time being. Both sides are ready to take the matter up again as soon as the legal status is established. The constitutionality of the law will come up for later hearing, but while being fought out in the courts the mines can resume work under a temporary agreement.

The Hocking Valley contingent is anxious to get to work on account of their lake trade. Lake shippers have orders on which they could have been loading two weeks ago, but for labor trouble and there is danger that this business will be cancelled to large extent and placed with districts which are not idle. Eastern Ohio coals being largely for steam purposes, feel no special demand at this time, and the producers there are likely to be more independent in their dealings with the miners. There is practically no difference between the two on a screen scale, but in case the mine-run law became effective there will be a varience of about 8c. per ton.

As far as the general market is concerned it would seem to make no difference whether or not Ohio mines resumed at this time. Demand for all grades in competition with this field is still sluggish. About the only signs of life are inquiries from public-service companies and some other big steam users, looking to the replenishing of storage stocks thirty or sixty days hence. This is having no effect upon the low-priced offerings made by West Virginia and Kentucky. Advices from these states show much dead coal in railway yards, with mines only running part time.

Orders being placed by the dealer trade for fancy splints are largely for July and August delivery, and can hardly be considered current business. The smokeless grades are maintaining schedule with difficulty, as prices are being shaded by independent producers.

Pending the resumption of work, the old circular is nominally in force as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.45@$1.35		$1.50@$1.40	$1.40@$1.35
¾-inch	1.30@ 1.25	$1.20@$1.15	1.35@ 1.30	1.30@ 1.25
Nut	1.25@ 1.20		1.30@ 1.25	1.25@ 1.20
Mine-run	1.15@ 1.10	1.10@ 1.05	1.15@ 1.10	1.15@ 1.10
Nut, pea and slack	0.85@ 0.80		0.85@ 0.80	0.75@ 0.70
Coarse slack	0.75@ 0.70	0.95@ 0.80	0.75@ 0.70	0.65@ 0.60

TOLEDO

Market continues quiet, but the outlook is more hopeful. Crop prospects never before so favorable. Industrial demand showing a tendency to improve and Lake trade looking better.

Nearly all the coal concerns report the situation quiet, but almost without exception they declare that business is bound to be better, later on. There is already some picking up in trade from the large manufacturing concerns; the railroads are also beginning to buy some little coal. The crop prospects in northwestern Ohio continue splendid in spite of the heavy rains of the past week which washed out some. The lake shipping is beginning to look better and it is believed that there will be a large demand from uplake ports as soon as the over-supply stocks are disposed of. There is a great deal of coal on track in Toledo and considerable is being loaded on big lake freighters. Prices remain unchanged and are being largely ruled by the law of supply and demand.

CLEVELAND

Demand for spot coal much improved and the approach of general buying movement seems near at hand. Retail circulars announced, but buying is limited. Lake shippers finding vessel capacity much easier.

Though prices have not changed materially the last week, the number of companies in the market has materially increased. The orders are not large, but indicate that stocks in consumers' bins are nearing exhaustion. Fairmount gas coal continues to be the principal product offered with Youghiogheny and odd lots of other Pennsylvania fuel appearing. West Virginia operators are not consigning much coal, but are accepting orders at prices no higher than consignment coal normally brings.

Youghiogheny shippers have had some slack on the market the last week at prices that compare favorably with Fairmount. Bargain prices on Pocahontas slack are being offered and operators are trying to move all they can to make it profitable to prepare sizes that are in good demand.

The Lake Market has improved from the shippers' standpoint. A week ago there were more coal cargoes than vessel capacity, but now the supply of tonnage is in excess of the demand. The first rush is over and coal that was under car service has been moved though not without leaving a large expense behind. The supply of cargoes from upper lake ports is so small independent vessel owners are having difficulty finding enough business to make it worth while to keep all of their vessels in commission. This has resulted in a few boats being temporarily tied at the docks.

The retail dealers have issued summer circulars. Hard coal is 15c. a ton higher than last year, 10c. of the advance being caused by the Pennsylvania tax and the 5c. was due to increased operating expense in the local yards. Other grades and kinds of coal have not changed prices this year. The issuing of summer prices is not an indication of retail sales. The bulk of the present business is booking orders for delivery in July and August.

Shipment at spot prices are practically the same, as follows:

	Pocahontas	Youghiogheny	Fairmount
Lump	$3.05		
Lump, 1¼-in.		$2.35@2.45	
Lump, ¾-in.		2.25	$2.00@$2.05
Mine run	2 60	2.10	1.90
Egg	3.05		
Slack	2.20@2.60	1.70@1.80	1.70@ 1.90

CINCINNATI

A slight improvement in the situation is apparent, largely due to the partial removal of the embargo on shipments to lake ports. Stocking of domestic coal is heavier locally, but the steam market is still slow.

With a steady increase in the movement of domestic grades, due to the beginning of deliveries by dealers, the market on this line of fuel is in much better shape than for some time. Smokeless is usually the leader, with contracts taking care of all available coal for several months ahead; and with a marked stimulation to the lake movement, it seems that the situation is in a fair way to be straightened out, as far as the domestic market is concerned.

The persistent depression existing in a number of industries which are normally large consumers of steam coal continues, and keeps this side of the market decidedly slow. In fact, despite several factors which have for some time tended to stimulate the trade, such as embargoes, labor troubles and lockouts, the market has for some weeks been decidedly dull. The increased production of screenings, due to the improvement in the domestic market, has therefore resulted in some cheap nut and slack being placed before consumers in this market, but this, as usual, has failed to help things to any extent.

DETROIT

Bituminous supplies still excessive and there is an almost complete absence of any business. Slack particularly heavy selling down to practically nothing.

Bituminous—The domestic market is quiet; in fact there is almost a complete adsence of any business. This applies equally well to contract business, the requirements on which are much reduced as a result of the accumulated stock There are many of the new contracts that have not been closed as yet, and consumers are expecting to obtain concessions on last years prices on these. The steam trade is also dull and heavy with much unsold coal on the market, some of which is occasionally moved at sacrifice prices.

Slack is particularly heavy, and selling down to practically nothing. In general, shipments to this market are so much in excess of requirements, that it is going to be exceedingly difficult to maintain any circular at all shortly. Supplies are in such excess that it is impossible to foretell when normal conditions will be reestablished.

Anthracite—The hard-coal trade continues up to full expectations, all the tonnages coming in having been easily absorbed so far.

HAMPTON ROADS

Dumpings for week have been good. Demand for run-of-mine showing some improvement. Less than a normal number cars in railway yards.

Dumpings over the piers at Hampton Roads during past week have shown up well and in consequence there is less than a normal supply of coal in railway yards. The principal shipments during the week as usual have gone to the New England market with foreign shipments to Port of Spain, Kingston, Canal Zone, Dakar, Para, Manaos, Santiago and Brindisi. So far as can be ascertained circular prices are being maintained. There is no demand for high volatile and no extra large amount of this coal on hand at tidewater.

The new pier of the Chesapeake & Ohio Ry., at Newport News, is now about completed and vessels may be loaded from there any day. This pier is about 200 ft. longer than the new one of the Norfolk & Western at Lamberts Point, but otherwise is almost identical in construction. It is understood that the Chesapeake & Ohio intend doing away with three of their small wooden piers, leaving only No. 12, which will be used to take care of barge loadings and perhaps small schooners or any overflow when the berths at the new pier are all occupied.

LOUISVILLE

Wage settlement expected to adversely affect the market. Some curtailment, but a few operators are selling at a sacrifice in order to keep the mines going.

No marked changes have taken place in the Kentucky coal market, though the labor settlement in a part of the western Kentucky field is expected to have a bearish influence on the market. The demand has shown no increase and though in the eastern Kentucky field work has continued on a rather generous scale, some of the operators are beginning to curtail.

Here and there in the eastern field an operator has sold at sharply cut prices, seeking to keep his organization going, even when necessary to sell below the cost of production. In a general way, however, prices continue at the former level. Orders for June are slow coming in.

In the western field, pea and slack, while scarce, is at a slightly lower price, ranging from 45 to 50c., f.o.b. mine, with nut and slack both east and west ranging from 60 to 75c. Eastern lump and block coals range from $1.30 to $1.80.

SOUTHERN AND MIDDLE-WESTERN

BIRMINGHAM

Improvement shown in steam grades, but lump coal still quiet. Furnace and foundry coke also dull. Pig-iron market is stagnant and car supply ample.

The Alabama operators are in a more optimistic mood than they have been for the past six months, believing that the worst of the dull market is over, and that business is on the eve of a prosperous season. While the market at the moment is far from satisfactory on steam coal, recent developments show an improvement in that line.

The government is now testing Alabama coals for use on the warships through the ports of Pensacola, Mobile and New Orleans, and will also probably place an order locally for approximately 10,000 tons of steam coal per month, for an indefinite period, to be delivered at Galveston for use on the warships, transports, etc. The French government has recently purchased a large tonnage of coal from this district for use on its warship in the Gulf, stating that a test has shown it to be equal to any in the world, and much cheaper, and that probably a much larger tonnage will be contracted for in the near future.

All of this has had a tendency to dispel the clouds of depression. The lump-coal market is only fair, though the majority of dealers are holding back, believing that they will get a reduction in price later on. The tonnage being moved is not as large as ordinarily at this time of the year. Blacksmith coal continues in a satisfactory condition, while both furnace and foundry coke are quiet. There is practically nothing doing in the pig-iron market, sales being small.

INDIANAPOLIS

Large buyers have about cleaned up the storage piles and are in the market again in a small way. Operators look for increased orders soon. Some domestic trade on account of cool weather.

With the Indiana wage scale settled for the next two years, operators are now busying themselves making contracts and are succeeding fairly well. The railroads, having exhausted the stocks laid by to tide them over the wage-settlement period, are now in the market again. The public utilities and factories are also near the end of their supplies. Most of the contracts being made or renewed are for two years. The factory situation seems about normal for the season. As the time for the wheat harvest approaches, there is a more optimistic feeling, and operators expect results soon from this improved sentiment.

Prices at the mines hold generally steady, although concessions of 10c. a ton are reported in spots, except for screenings, which are scarce. The domestic trade in Indianapolis has been better than usual for May, although after the signing of the scale there was a let-up in demand from consumers. Retailers say that such contracts as they have been able to make for Eastern coal are on about the same basis as last year's. The fact that the Illinois operators and miners have signed up, takes away somewhat from the expectations of the Indiana coal operators that they would reap advantage from any continued trouble in neighboring states.

CHICAGO

Market shows improvement. Spot buying increased by railroads and other public utilities. Many contracts renewed on last year's basis. No improvement seen in anthracite or smokeless coals. Coke market continues dull.

Slightly better conditions were evident n the Chicago market during the week. With railroads running through their storage piles and factories doing the same, some spot buying has developed. The demand is steady, but there were no purchases of unusually large lots. The majority of the companies are renewing contracts on practically the same basis as last year. The only increase in price is in screenings, in a few cases this being from three to five cents higher. But the dealers are not buying much for the future, as money continues tight with them. They are, however, taking the attitude that the small amount of business evident is a herald of more to come.

The tone of the anthracite market continues dull, with but little buying. Conditions are not up to the normal expected for this time in May. The trade is disturbed somewhat by an announcement that tariffs have been filed by the larger roads requesting an advance of 25c. a ton on anthracite in Chicago and the territory reached by the Chicago market.

Mines are sending smaller shipments of smokeless than is customary, as a result of warm weather. Contract shipments are being filled, but there is little outside buying. The market for this coal is practically established at $1. Illinois mines resumed operations following an agreement between producers and miners, but they are being run only on half time. With dull conditions in the iron and steel trade, furnace and foundry coke is also slow. There is little active trading in domestic coke, due to conditions which effect other domestic fuels.

Prevailing prices at Chicago are:

	Springfield	Franklin Co.	Clinton	W.Va.
Domestic lump	$2.07	$2.30@2.40	$2.12	
Steam lump	1.97		1.97	
Egg		2.30@2.40		$3.65
Mine-run	1.87	2.15@2.25	1.87	3.05@3.30
Screenings	1.77	1.95	1.67	

Coke—Connellsville and Wise County, $5@5:25; byproduct egg, stove and nut, $4.45; gas house, $4.25.

ST. LOUIS

New wage scale signed up on the same basis as the old one. Mines resuming operations and there is a surplus of coal with prices low.

The labor situation in Illinois is practically cleared up with the same arrangement for the coming two years as the operators and miners had before. Mines are gradually resuming in Williamson and Franklin counties, and also in the fifth and ninth districts. Several of the operations started in to apply lump coal on mine-run contracts, with the result that a heavy tonnage of screenings was produced, which cut the price from 95c.@$1 down to 80c. and 85c. in the high-grade field, and the Standard about the same.

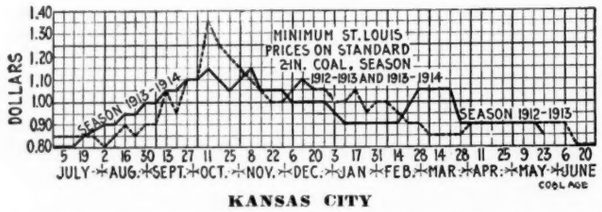
The St. Louis Public School contract was awarded the Polar Wave Ice & Fuel Co. on Standard coal, at a price of $1.74¾ per ton delivered, up to $1.77 delivered. Figuring on

the $1.77 price, with 52c. for freight, this leaves $1.25, and deducting 40c. there is only 85c. left; there is also a city scale ticket and the natural loss on a car of coal, which brings the price down to about 85c. at the very most. In addition, the coal has to stand inspection before it is delivered. Contracts are being taken on steam business for wagon-load delivery, at the rate of two loads a week, at $1.78 per ton delivered, for Standard lump coal. The only result of this competition will be a few more bankrupt operation shortly.

The Franklin County operators have advised that their coals will advance 10c. a ton per month, beginning with June 1 for domestic sizes, and it is expected that this action will be followed by the better producing mines in Williamson County. Domestic business locally is at a standstill, with the exception of anthracite, which is moving in fairly good volume.

The market is now quotable as follows:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard	Sparta
2-in. lump	.....	.....	$1.20	$0.85@0.90	$1.15
3-in. lump	.....	.....	1.25	.....	.....
6-in. lump	$1.20@1.30	.....	1.30	1.15@1.25	1.35
Lump and egg	1.85@2.15	$2.00	.....	.....	1.15
No. 1 nut	1.20@1.30	.....	.....	.....	.....
Screenings	0.80@0.85	.....	.....	0.65@0.70	0.75@0.80
Mine-run	1.10@1.20	.....	.....	0.80@0.85	.....
No. 1 washed nut	1.40@1.50	2.25	1.50	.....	.....
No. 2 washed nut	1.35@1.45	.....	1.25	.....	.....
No. 3 washed nut	1.25@1.30	.....	.....	.....	.....
No. 4 washed nut	1.25@1.30	.....	.....	.....	.....
No. 5 washed nut	0.80@0.85	.....	.....	.....	.....


DOLLARS
1.40
1.30
1.20
1.10
1.00
0.90
0.80
MINIMUM ST. LOUIS PRICES ON STANDARD 2-IN. COAL, SEASON 1912-1913 AND 1913-1914
SEASON 1913-1914
SEASON 1912-1913
5 19 2 16 30 13 27 11 25 8 22 6 20 3 17 31 14 28 14 28 11 25 9 23 6 20
JULY AUG. SEPT. OCT. NOV. DEC. JAN FEB. MAR APR. MAY JUNE
COAL AGE

KANSAS CITY

Decreased production injects a better tone into the trade. Prospects of a record-breaking wheat crop also creating a more hopeful feeling.

Business has apparently improved in the Southwest, though some sales managers take the attitude that the increase in demand is rather apparent than real, being the result of decreased production. A new source of business has opened up, however, following preparations for the harvesting of one of the biggest wheat crops of years in Kansas and neighboring states. All of the threshers burn coal, and operators are looking forward to the harvesting with almost as much eagerness as the farmers themselves. The indirect results of the big crops also are worth noting, having a highly favorable effect on business in general. The lack of demand for lump has resulted in cut prices in some cases, though many operators prefer holding it rather than selling at the quotations which have obtained in some quarters recently.

PORTLAND, ORE.

Warm weather causes rapid falling off in demand. Inquiries regarding coal shipping through Canal. Australian coal has dropped out of the local market.

Warm weather set in a couple of weeks ago and since then the coal trade here has been decidedly sluggish. In fact, it is said that business has not been so slack for many years. The chief demand is for domestic purposes, industries mostly using electricity, fuel oil or wood. It is pointed out, however, that if the opening of the Panama Canal results in lower freight rates, the consumption of coal will be much increased. Under existing conditions coal and wood prices are about equal. Pennsylvania anthracite now is quoted at $18 per ton here, it will be possible to retail it at $12@13 per ton when shipped in vessels by canal route. West Virginia coals, such as New River and Pocahontas, that now sell here at about $18 per ton can be retailed at $10 or $12 per ton. At present these coals are brought here by rail and the Great Lakes route.

With Utah coal selling here at $9.50 a ton, delivered, it is expected that if West Virginia coal can be obtained at $10 or $12 per ton, the railroads carrying the Utah, Wyoming and Washington coals will grant more liberal freight rates. This would bring coal prices to a lower level than wood and result in a larger consumption.

Coal dealers are of the opinion that very little Australian coal will be imported here in the future, as freight rates are too high at present, and it also means tying up of too much money.

PRODUCTION AND TRANSPORTATION STATISTICS

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for March, 1913-14, and for the nine months ending March, 1912-13-14, in long tons:

	9 Months			March	
Imports from:	1912	1913	1914	1913	1914
United Kingdom	5,911	7,451	9,691	96	1,231
Canada	729,584	1,061,411	746,411	107,048	91,645
Japan	12,885	42,657	83,208	440	1,732
Australia and Tasmania	159,720	117,158	197,925	10,141	25,798
Other countries	1,501	3,257	3,430	.....	1,420
Total	909,601	1,231,934	1,040,540	117,725	121,826
Exports:					
Anthracite					
Canada	2,530,190	3,324,179	2,607,383	153,572	162,152
Uruguay	.....	.....	84	.....	.....
Other countries	48,270	58,947	46,639	4,950	1,279
Total	2,578,460	3,383,126	2,654,106	158,522	163,431
Bituminous,					
Canada	7,987,237	8,295,614	9,577,352	736,549	620,366
Panama	330,433	340,259	281,394	32,500	23,690
Mexico	235,493	264,537	235,122	57,629	29,978
Cuba	804,094	915,889	902,437	110,727	115,303
West Indies	506,769	456,013	425,071	53,308	44,614
Argentina	.....	.....	99,388	.....	22,978
Brazil	.....	.....	196,837	.....	11,150
Uruguay	.....	.....	40,492	.....	18,453
Other countries	774,316	741,597	905,457	99,230	132,080
Total	10,637,342	11,013,909	12,663,450	1,089,943	1,018,612
Bunker coal	5,124,183	643,942	582,129	5,754,530	5,377,070

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic from the New River, Kanawha and Kentucky districts for March and the nine months ending Mar. 31, 1912 and 13, in short tons:

	March				Nine Months			
Destination	1914	%	1913	%	1914	%	1913	%
Tidewater	323,567	20	328,442	24	2,587,748	19	2,720,022	23
East	242,136	15	292,410	20	1,987,701	15	2,032,099	16
West	931,657	59	700,150	50	8,163,886	60	5,809,347	56
Total	1,497,360		1,321,002		12,739,335		11,561,468	
From Connections								
Bituminous	98,733	06	71 588	05	825,951	6	494,699	04
Anthracite	945		309	01	11,421		9,138	01
Total	1,597,038	100	1,392,899	100	13,576,707	100	12,065,305	100
Coke	40,658		32,207		292,105		227,550	

FOREIGN MARKETS

GREAT BRITAIN

May 8—The market is not quite so firm. Buyers are only arranging their pressing requirements in anticipation that, with a reduction of present tonnage supplies and increased production, easier conditions will be in evidence. Chartering has recently been rather slow. Quotations are approximately as follows:

Best Welsh steam	$4.68	Best Monmouthshires	$4.20
Best seconds	4.44	Seconds	4.08
Seconds	4.26	Best Cardiff smalls	2.70
Best dry coals	4.32	Seconds	2.58

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are net f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days.

Coke is quoted at: Special foundry, $6.24; good foundry, $4.80@5.52; furnace, $4.08@4.56.

COAL FREIGHT DECISIONS

I. C. C. No. 5912—Lombard Brick & Tile Co., vs. Chicago and North Western.

Following **Hammerschmidt & Franzen Co. v C. & N. W. Ry. Co., ante,** page 71; **Held.** That defendants' rates for the through transportation of coal and coke from points east of the Illinois-Indiana state line to Lombard, Glen Ellyn, Wheaton, and West Chicago, Ill., are unduly prejudicial to those points and unduly preferential to Chicago and Proviso, Ill., in the amounts stated herein.